Telephone Engineer

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Bell License Fee Reduction

One of the developments of the present year that is significant but which has aroused little if any comment or attention is the reduction of the license fee charge by the American Telephone and Telegraph Company to Bell system companies. Beginning January 1st, the fee was reduced from two per cent of gross revenue to one and one-half per cent. This reduction comes only one year after the fee was reduced from four to two per cent at the time ownership of transmitters and receivers was transferred to the operating companies.

It may be assumed that the Bell system had its own business reasons for making the reduction and it is certain that the license charge is now approaching a figure that even the most radical public utility baiter can not call exorbitant. It is interesting to note in one of the long drawn-out rate cases, objectors to the higher license charge are now objecting to the manner in which the telephone instruments were transferred to the operating company.

There is no question that the Bell companies receive substantial services in return for the charge and it would not be surprising to see Independent companies availing themselves of the service, especially if the charge can be reduced a little more. In fact, one large Independent property has signed such a license contract in the past year. Any Independent company operating in large enough territory to require loaded cable, repeaters or carrier systems would find no other place to get engineering and other service in connection with these except from the Bell system. As several systems are approaching this size, it would not be surprising to hear of others arranging for such service under the regular license contract, excluding, of course, the financial service.

Nothing to Sell

"The difficulty with some telephone systems is that they have nothing to sell," said the operating head of a large group of telephone companies at an after-hour panning bee in one of the exhibit rooms at a recent telephone convention. He went on to say that an exchange with nothing but magneto grounded lines represented one of the best opportunities in the telephone business.

The management of such an exchange has the opportunity of filing an optional rate for metallic service and it immediately has something to sell. There is a new incentive for selling effort which will result in increased revenue and improved service. If the selling effort is successful, the increased revenue will justify and attract the investment of the added capital.

When the property reaches a point where a large percentage of the plant is on a metallic basis, a selling drive can be made to convert the remainder. After this is completed, there is opportunity to convert the plant to common battery or dial operation, again on an optional rate basis. This will give a new sales opportunity and the process can be repeated. As new developments come in the art, it is probable that additional opportunities will develop.

There is no doubt that one of the things that is wrong with many telephone companies is that they have nothing to sell. It is equally certain that the reason for their having nothing to sell is because they have lost the selling habit. Not all of them can follow a program like that outlined, but there are always selling opportunities and the successful companies of the future will be those that have something to sell and that sell what they have to the public they serve.

Keep the Circuits in Service

Many stories have been written of the hardships and self-sacrifice of telephone workers in restoring service and in keeping service going in spite of storm, sleet, flood and fire. No effort is too great, no hours are too long and no condition is too hazardous for these fine men and women when there is a question of maintaining service. Probably all of the stories that have been told and all of the praise that has

been bestowed does not cover one-tenth of the amount deserved.

Yet we have seen men who will willingly spend hours in all kinds of weather, tramping through snow or sleet when other methods of transportation fail, to restore service on damaged lines, unthinkingly put out of service several circuits in the course of their ordinary work by failure to observe a little care when rearranging wires on a pole line. How many trouble records show "Gang Working" as the cause of trouble on toll lines? Again, how many of these reports have been absolutely unnecessary?

The men themselves are not so much to be blamed for this condition as is the supervision of their work. A lineman has little vision of the constant stream of messages that is constantly passing over a busy circuit group. He does not think that a monetary interruption of one wire may affect an entire phantom group or even a multi-channel carrier system. He sees only the wire before him and the work to be done on it.

Very little of the trouble that arises from this cause is intentional. Most of it could be avoided if the men were properly instructed and if the importance of the matter were fully explained to them. The habit of handling lines so that a minimum amount of interruption will be experienced can be developed if supervisory forces will give attention to it. It naturally follows that the fewer the interruption, the better will be the service and the greater will be the revenue return.

A Federal Decision on Broadcast Reception

There is prospect of an early determination of one of the questions affecting program service distribution companies as a result of a federal court decision as to the right of a hotel to receive a copyrighted composition for entertainment of guests. The question at issue was as to whether the reception of such a composition for entertainment constituted performance of the work. Judge Otis of the Federal District Court in Kansas City ruled that this did not constitute performance and in making the decision announced a principle that goes much further than mere reception of a number.

According to new reports, Judge Otis said: "The right to perform a musical composition does not carry with it a proprietary interest in the waves that carry it out on the air or upon the ether. They are as much the common property of all as the sunshine and the zephyr." Based upon his opinion that reception did not constitute performance, the judge refused to issue an injunction or to award damages.

It is probable that the decision will be appealed to the Supreme Court, and when a final decision is made, several points in the rights of individuals to pick up broadcast matter and to make use of it will probably be determined. Those who are interested in rebroadcasting and in program distribution will watch for the decision with interest.

The Bell Bond Issue

Our comment last month relative to the forthcoming issue of convertible bonds by the American Telephone and Telegraph Co. was made before the terms of the issue were made public. Reference was made to the surprise in financial circles that this type of security should be issued by the parent Bell Company. The terms of the issue are now announced, but the reasons for the choice are not made public.

It was suggested in the comment that the desire to keep the financial structure well balanced was possibly an influence, because the A. T. and T. Co. undoubtedly could have issued stock which would have readily been absorbed by the market. Certainly from the standpoint of the corporation, the issue of the 4½ per cent bonds convertible into common stock at a substantial premium over par will bring the company more money for the issue at a lower cost than a stock issue at par.

On the other hand, at its present earning rate, the A. T. and T. Co. does not need that advantage of money at low interest rate in order to earn a handsome return on its common stock. That company is commonly regarded as one of the foremost in the country in its studies of future conditions. Its forecasts of the future business conditions may have had something to do with the selection.

A suggestion is made in the announcement that studies for a future trans-Atlantic telephone cable are under way. If this project is undertaken it will require a heavy capital investment, the return on which is of somewhat uncertain character. Perhaps the surplus that will be built up if the bonds are converted is something in the nature of an insurance to cover the financial success of this project.

In any case, the enviable financial condition of the parent Bell Company is shown by the fact that it can market an issue of 4½ per cent bonds with conversion rights into stock at large premiums, and that it can do so without the assistance of an underwriting syndicate of bankers.

Telephone Industry to Spend Billion Dollars

General Prosperity Throughout the United States Finds This Industry Well Entrenched Financially

Expenditure of approximately one billion dollars by the telephone industry for telephone and plant equipment, construction and maintenance, is forecast in figures compiled by TELEPHONE ENGINEER and gathered from sources which it believes to be reliable. The figures are secured from reports covering every section of the country, which leads us to believe that this giant industry is in better financial condition than at any time in its history.

Questionnaires were mailed to many organizations in the Independent group and replies from practically every state shows very extensive appropriations for buildings, installations, conduit and construction. Many of these programs will not be completed until next year, so large are the undertakings.

The Peninsular Telephone Company, Tampa, Florida, including its exchanges comprising the organization, have a program for 1929-30 of approximately $1,500,000. Most of this money to be expended for installations, extensions and cable construction. Of this expenditure only a small amount goes to buildings.

The Florida Telephone Corporation, Leesburg, Florida, has an appropriation of $85,000 for 1929-30.

The Mutual Telephone Company, Erie, Pa., state that they have set aside an appropriation of more than half a million dollars for installations, etc., for 1929 and probably a larger sum for 1930. Of this sum less than one-sixth is for land and buildings.

The Petroleum Telephone Company, Oil City, Pa., and the Peoples Telephone Corporation of Butler, Pa., are making additions and installations of more than $200,000.

Logansport Home Telephone Company, Logansport, Ind., is laying considerable conduit and cable; the Genessee Co-operative Telephone Company, Genesee, Ill., has several thousand dollars for general improvements; The Rose Telephone Company, Hobart, N. Y., is another exchange scheduled for substantial improvements.

The Scotia Telephone Company, St. Louis, Mo., will expend $50,000 for buildings, extensions and maintenance among its exchanges for the year.

Lorain, Ohio, is scheduled for improvements valued at more than one-third of a million dollars. While Newark Telephone Company, Newark, Ohio, has a similar amount

We could enumerate instances throughout the country where large amounts have been appropriated and work under way. From information gathered we feel safe in estimating that nearly half a billion dollars will be spent during the next two years by the Independent telephone industry in the United States.

According to President Walter S. Gifford of the American Telephone & Telegraph, there are 8,300 Independent telephone companies in the United States in addition to 30,000 farmers' lines. These companies own over 4,300,000 stations, according to Mr. Gifford.

Quoting from statistics of the A. T. & T. Company we have the following figures:

Bell System Has Big Construction Program for 1929

"During 1929 the Bell System plans to expend approximately $575,000,000 for gross additions to telephone plant and equipment. This construction program, the largest by far in the history of the System, is necessitated by the ever increasing demand of the telephone using public for more comprehensive and speedier service. The amount which the System plans to spend on gross additions to its facilities during this one year alone is equivalent to about $40 for every one of the more than 14,500,000 Bell System telephones in service at the beginning of the year. It is also approximately one and one-half times the original cost of building the Panama Canal; or, stated another way, the estimated expenditures of the Bell System during the present year for new construction and for replacement of existing plant will amount to more than $1,000 a minute.

The construction program for 1929 includes the expenditure of about $240,000,000 for exchange and toll lines, more than $140,000,000 for central office equipment, and over $100,000,000 for station equipment consisting of telephone sets, private branch exchanges, booths and special fittings, etc. More than $50,000,000 will be spent for land and buildings during the year.

The amounts of material which will go into this construction work in 1929 are tremendous. More than 1,200,000 telephone poles will be used, which would be sufficient to construct more than 30,000 miles of pole lines with 40 poles to the mile. Over 1,500,000 cross arms, 27,000 tons of bare copper wire, over 6,000 tons of galvanized iron wire, as well as 46 billion conductor feet of wire in lead covered cables will also go into this construction work.

Big Long Lines Construction Program for 1929

"The 1929 Construction Program of the Long Lines Department, American Telephone and Telegraph Company, contemplates a gross expenditure of nearly $82,000,000 for new plant to be installed during the current year, an increase of about $33,000,000 or 67 per cent over the amount spent for new plant in 1928, which was a record year to date.

The new facilities will be used to improve the present long distance telephone service and to provide for substantial increases in the business, including extensions in transoceanic service.

This program provides for the installation by the Long Lines of about 2,500 miles of cable most of which will be owned jointly by the Long Lines Department and the different Associated Companies of the Bell System. More than 1,000,000 loading coils and about 24,000 telephone repeaters are required in connection with the new and existing cables. In addition, the Long Lines plans to obtain an interest in about 675 miles of long distance cables to be installed during 1929 by Associated Companies. Some of the other major projects include the stringing of over 74,000 miles of new aerial wire the installation of fifty-eight carrier current telephone systems, twenty-four carrier current telegraph systems, and four additional transoceanic short-wave transmitting and receiving sets.

CONVENTION SCHEDULE

Up-State Telephone Association, Seneca Hotel, Rochester, N. Y., May 22, 23 and 24.

Pennsylvania State Telephone and Traffic Association, Harrisburg, May 28 and 29.

Telephone Association of Vermont, June 25 and 26, Hotel Van Ness, Burlington, Vt.

Studying Telephone Methods

By E. R. COLLINS
Manitoba Telephone System, Brandon

CHAPTER 27

The Calling Device and Its Purpose

When the subscriber at a common battery telephone removes the receiver from the hook, the line lamp will burn because the line relay armature is pulled up. When the hook switch is moved up and down the lamp will flash each time the hook comes up. The current is flowing over the line while the line lamp is burning. When such a line is connected to the cord circuit, however, the supervisory lamp is out when the receiver is off, and burns as soon as the hook is pulled down. If the receiver hook switch is now moved up and down, the supervisory lamp will flash each time the hook is pulled down, or in other words the supervisory lamp current is flowing only when the current over the line stops its flow.

Each time the supervisory relay operates, it is impelled or forced to operate by the flow of current over the line. Thus each time this relay operates, we say there is an impulse sent over the line. A number of operations of the hook switch will produce an equal number of impulses.

The speed of the impulses will determine the speed at which the relay armature will operate. There will be found a point at which flashing the hook switch up and down will not produce a series of flashes for two reasons. The armature of the relay will not be able to operate as quickly as the changes in the line circuit, and the heated filament of the lamp will hold enough brilliancy during the short intervals when the current is cut off, to produce a steady glow.

If we wish to make the lamp respond quickly to quick changes in the line, we must do two things. Make the release of the supervisory relay quick, and use a shunt circuit such as used in the Western Electric No. 1 cord circuit, to make the lamp respond quickly.

If we wish to operate signals over the common battery line we are compelled to make these signals respond to breaks in the line circuit, because the line circuit must be constant when the subscribers are talking. So any operations of lamp signals or other devices from the subscriber's hook switch must be done during the periods that the line circuit is opened.

The first consideration would then be to have a speed that is constant. The speed of impulses made by operating the hook switch will vary. It is practically impossible to produce impulses of a uniform length and speed by hand. So we find in automatic telephones a device called a dial or calling device.

In Fig. 224 is shown a cut of a typical calling device which is in quite common use today. This consists of a dial mounting plate on which is mounted a set of impulse springs. These springs are so arranged that a fibre insulating cam wheel comes between the tips of the springs, and opens their contacts. This has exactly the same action as the opening of the hook switch springs. This fiber cam wheel is mounted on a small shaft with a pinion and a specially cut gear. The gear is meshed with a worm on a shaft. This worm gear shaft is fitted with a pair of governor wings which in turn run in a governor cup. For these not having a calling device to examine, I might say that you will have the same arrangement on a larger scale in the phonograph motor. The purpose of this worm shaft is to control the speed at which the pinion and cam wheel will turn.

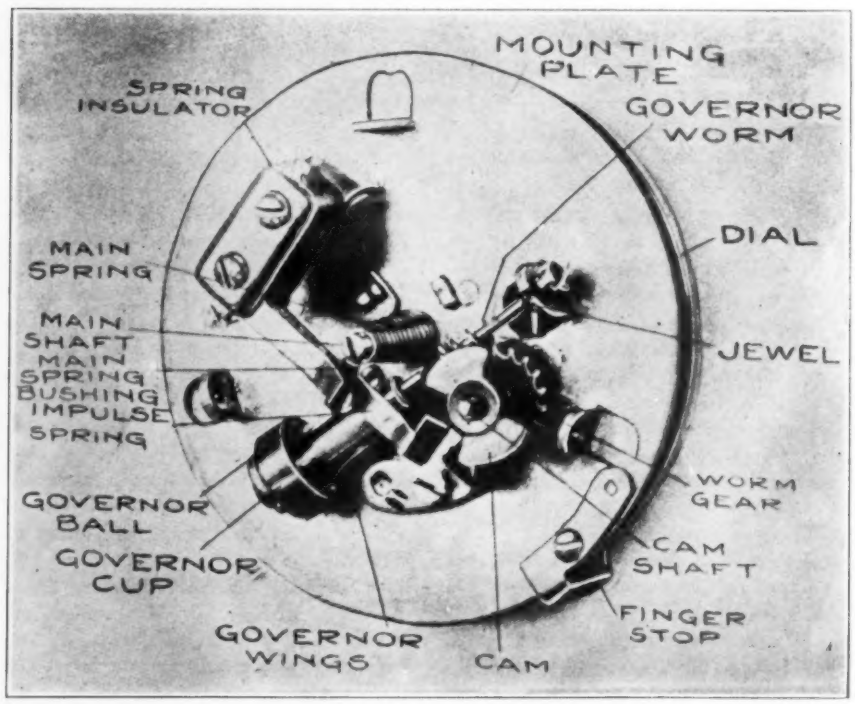
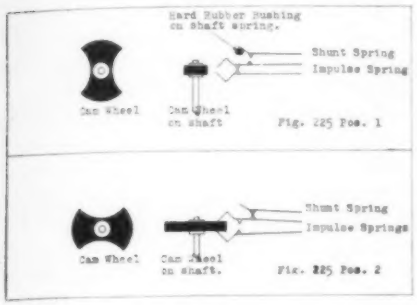


Fig. 224

On the under side of the dial mounting plate in Fig. 224, there is shown another plate with holes in it. This is the dial plate and is made to revolve. Between the dial plate and the dial mounting plate there is another gear, called a ratchet gear. The cogs of this gear wheel mesh with the cogs of the small gear on the cam shaft. If the *dial plate* is turned in one direction it does not turn the large gear, but a small spring trips over the ratchet steps on this ratchet gear. At the same time, the dial spring mounted on the shaft of the dial plate is wound up. When the dial plate is let go, the dial spring drives it back to its original position again. But the ratchet spring is pressing against the ratchest gear, so it must turn as well, this in turn rotates the cam shaft forcing the cam wheel to pass between the impulse springs. The peculiar shape of the governor worm and gear will not allow the cam shaft to turn forward, so that when the dial plate is being pulled around the cam wheel does not turn, but turns freely when the dial plate is returning. The governor shaft is subjected to an end thrust. To prevent friction the ends of the shaft are set in bearing screws, in which are set small jewels to lower the friction on the end of the governor shaft. The main thing to remember about these bearings is that they should be kept clean. If oil is used on these bearings, excess heat or cold will have a bad effect on the speed of the governor which will produce poor service.

In Fig. 225, position 1, we have shown the shape of the fiber cam wheel and its position in relation to the impulse springs. The cam wheel, as shown in position 1, shows how the fiber is cut away so that

it is free of the springs. This is the normal position of the cam wheel, so that the contacts of these springs are touching.



The pressure must be on the contacts, and not on the ends of the springs.

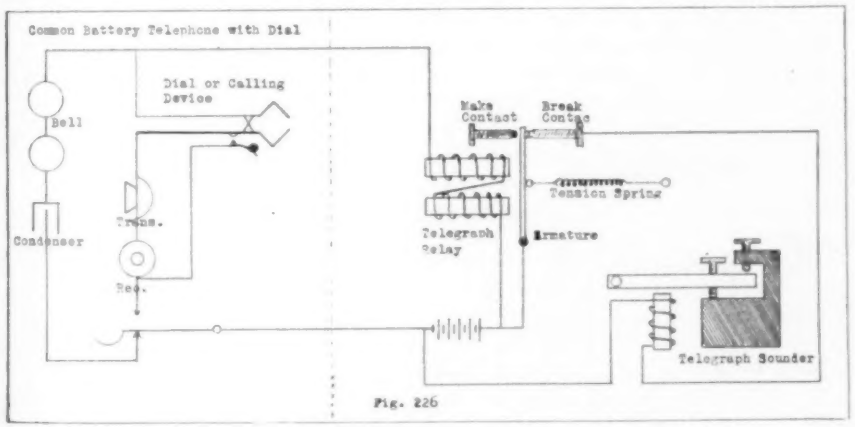
Now if a subscriber places his finger in the hole over No. 1 on the dial plate and pulls it to the finger stop the dial ratchet spring slips over one ratchet tooth of the ratchet gear wheel. The dial spring is given enough tension to force the dial plate back when the subscriber lets go. The dial plate in turning back turns the impulse wheel *one-half* revolution, opening the line once, and producing one impulse. Pulling the dial from Fig. 2 operates the cam wheel on returning one full revolution, producing two impulses. When the dial plate is pulled from Figure "0," ten impulses are produced, the cam wheel revolving five times.

A hard rubber bushing is mounted on a projection of the dial spring. This of course turns every time the dial plate and its shaft are turned. When this spring is normal, the hard rubber bushing is resting against a third contact spring called a *shunt spring* and holds it away from the impulse springs. When the dial plate is turned away from normal, this bushing moves also and allows the pressure of the shunt spring, to bring it in contact with the upper impulse spring. This contact is maintained until the bushing returns again to normal. In Fig. 225 position 2 the cam wheel is shown turned so that it is forced between the springs. This opens the contact between the impulse springs, but the contact with the shunt spring is still maintained. Due to the shape of the cam wheel there is a definite relation between the time the contact of the impulse springs are opened and closed. Thus the calling device not only controls the speed, but also the duration of the impulse.

In Fig. 226 the position of the calling device in the telephone circuit is shown. When the shunt springs are closed, there is a short circuit, or shunt around the receiver and transmitter, which are shown in series. During the time the cam wheel is opening and closing the line the resistance of the transmitter and receiver are cut out of the line. This accomplishes two things. It prevents the subscriber from hearing the impulses in his receiver, and also prevents the variable resistance of the transmitter from affecting the current flowing over the line during the impulsing period.

We have shown the telephone connected to a telegraph relay and a battery. The contacts of the relay are reversed, so that when the relay armature is pulled up, its contact rests against a bushing in the contact screw. When the relay armature is released, it makes contact with the break contact screw and pulls up the telegraph sounder connected to it.

On the sounder there is a tension spring and screw which we have not shown. This holds the armature up away from the magnets. Increase the tension of this spring, and also increase the gap between the armature and the magnets. Adjust the sounder so that its armature will only hit the anvil firmly, when the armature of the relay is normal. Now operate the dial to Fig. "O" which will send ten impulses over the line. This will send impulses at the rate of 10 or 12 per second. Repeat this operation several times, and at the same time change the tension of the tension spring of the relay. It will be found with a weak tension that the sounder will make very light raps on the anvil if at all, or will make a fluttering sound. This action can be changed to a firm tapping, by increasing the tension of the relay armature spring. The sounder with the adjustment given will require quite a pull to operate it. Increasing the spring tension of the relay increases the pressure of the contact, but also decreases the time required for the relay armature to come back to normal. It is this time and contact pressure that are required, to allow the sounder magnets to become saturated, before the current is cut off again. Unless the sounder magnets reach full saturation quickly, the pull on the sounder armature will be weak, and we call the impulses *weak*. When the sounder armature strikes firmly the impulses are spoken of as being heavy. Now when the relay armature has received this firm adjustment, try the effect of weakening the tension of the upper impulse spring Fig. 226. If the pressure between these springs is weak, the telegraph relay will possibly receive more than the 10 impulses desired, due to the bouncing of the contact springs. These two springs must have a firm contact. There should be a follow-up of at least 1/16 inch for each contact. That is if the lower spring is forced away from the upper, the upper spring should follow down after the lower spring 1/16th of an inch from its normal position. The same applies to the lower spring following the upper spring when the pressure is taken off the upper spring. If this follow-up is noticed, there must be firm contact between the springs. The contacts sometimes become loose in the impulse springs, and cause high resistance in the circuit. This shows up in a report of getting wrong numbers. The contact of the impulse springs is therefore quite important.



Sparking at Contacts

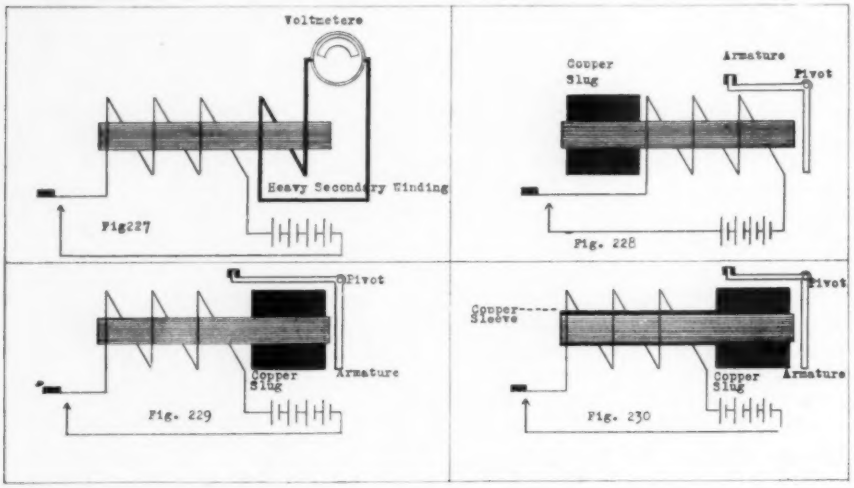
The amount of current required to operate the sounder with a heavy tension will be quite heavy. This means that there will also be a strong counter current set up due to the heavily saturated magnetic fields. This counter current will jump the contacts as soon as they open. There are two general methods of suppressing sparking at contacts. The condenser method and the noninductive winding.

The condenser used will depend on the amount of current flowing but more so on the speed of impulsing. For a speed of 10 to 12 impulses per second a condenser of ½ M. F. as shown in Fig. 232 is used.

With the condenser alone connected, there will still be a spark appearing at times, but of a different color. This is due to the condenser discharge getting out of step with the speed of the armature. This can be overcome by adding a small resistance in series with the condenser. A resistance of 10 or 15 ohms wound on a piece of fibre is used. This resistance has the effect of preventing the condenser from discharging its whole charge at once. This combination will quench the spark of the vertical and

rotary magnets used in automatic switches.

Another method which is more compact and very effective is the non-inductive winding. This is a winding of higher resistance wound non-inductively over the winding of the coil being operated. A non-inductive winding of say 200 ohms connected in parallel with the telegraph sounder as shown in Fig. 231 will wipe out the spark at the relay contacts, and will not appreciably effect the operation of the sounder itself. This method is more economical in space and equipment than the condenser method, and will wipe out entirely the whole spark.



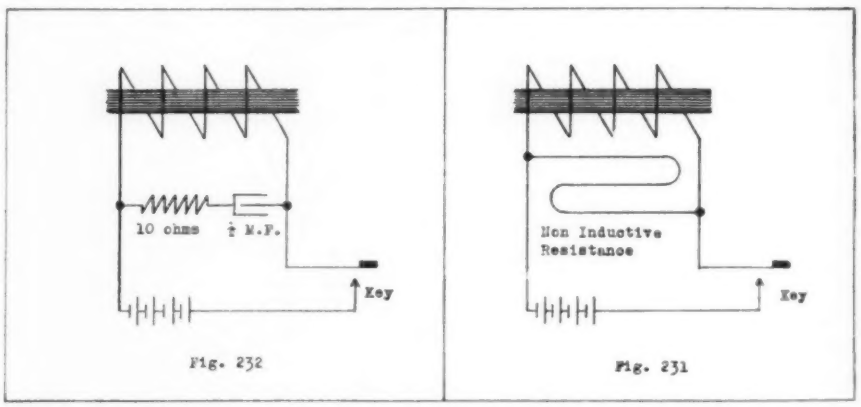
Relays

The type of relay required for a line relay would necessarily be one that will pull up quickly, and yet will release quickly. As there will always be a certain amount of residual magnetism in any relay coil, the quick releasing action must be assisted by spring contact. The line relay that is connected in the circuit with the calling device, must therefore be adjusted to have a stiff spring pressure, and the moving spring can be made quite heavy. In Fig. 228, 229 and 230 there are three relay assemblies shown. The shape of the armature will first be discussed. We have already learned that the strength of the magnetic field weakens very rapidly as the gap between the armature and the core is increased. To take advantage of the maximum field intensity we must maintain this gap as small as possible. If we pivot the armature as shown in Fig. 229, and make the arm carrying the bushing longer than the distance from the pivot to the center of the core we secure a lever action. Suppose the ratio of this length is 2 to 1. Then it would require twice as much force exerted by the core on the armature as would be transmitted to the springs. As the armature comes closer to the core the pull increases rapidly, and will overcome the increase in pressure of the springs as they are forced out of line. When the current is cut off, however, the springs have double the pressure to pull the armature away from the core, and this gives a very quick release. This type of relay armature permits of great pull with very quick action. The construction of the spring assemblies will be taken up in the next chapter.

Slow Acting Relays

In addition to requiring a quick acting relay, we also require relays that are slow to release. The theory of the slow acting or slow release relay is shown in Fig. 227. We have here a core on which are two windings, one a large number of turns connected to a battery with a key. The other consists of one or two turns of very heavy wire connected to a voltmeter or ammeter. When the battery key is closed, the current sets up a field within the primary coil. But this field extends itself to the end of the core, and in doing so cuts through the secondary heavy winding. This sets up a current in the opposite direction to the impressed current from the battery. This opposing current sets up a momentary field of its own in the opposite direction to the field set up by the battery. There will therefore be a disturbance within the section of the core covered by the heavy secondary winding, which will delay the saturation of the core in this section. This induced current will be indicated in the meter by swinging the meter say to the right. When the current is cut off, there will be an induced current in the secondary winding in the same direction as the battery current was flowing. This current flow will then set up a magnetic field in the same direction as the field set up by the battery. Thus the breaking down of the magnetic field of the whole core will be delayed by the action of this second induced current. This induced current will be indicated by the meter needle swinging to the left.

In Fig. 228 we have the secondary winding in the form of a copper ring. Now any current impressed on the winding of the coil will induce a current in the copper ring or slug. This induced current will be of extremely low voltage, because there is only one turn of secondary to many turns of primary. But there will be a large current flow of several amperes at a low fraction of a volt. The resistance of this winding will be so low, that the full effect of the induced current will be available to set up a magnetic field. Suppose as in Fig. 228 the armature is on the end opposite to the slug. Then the battery flow will build up a field, which passes across the gap and through the armature and back over the heel piece to a point where the slug commences. This will immediately pull the armature which commences its travel toward the core. The current induced in the slug has in the meantime retarded the saturation of that part of the core within the slug, but has not appreciably affected the pulling up of the armature. When the battery is cut off, the slug sets up its counter current, and its magnetic field in the same direction as the battery field, and delays the breaking down of the field in the whole core so that the armature will hold on for a fraction of a second after the battery is cut off. The longer the slug the slower the release of the armature.



Slow Pull Up and Slow Release

In Fig. 229 the copper slug is shown on the same end of the core as the armature. Now if battery is applied to the winding of the coil, it will mag-

netize the section away from the armature first. But due to the disturbance of the induced current in the slug, the end of the core nearest to the amarture will be slow in becoming saturated. This will cause a weak pull on the armature until the disturbance has stopped, when the full magnetic pull will operate the armature. Again when the battery current is cut off, the breaking down of the field is delayed, and the armature is held in for a time after the battery current has been cut off. This then gives a relay that is slow to pull up, and slow to release.

Then in Fig. 230 we have another scheme to make the relay very slow to pull up and slow to release. This used for instance where alternating current for ringing may be passed through the winding, to ring the telephone, and then when the receiver of the called subscriber answers, battery flows through. The relay is very sluggish in pulling up as there is a copper sleeve over the whole length of the core which opposes the magnetic effect of the alternating current in the winding. It also appreciably delays the operation of the armature when battery is passed through the coil, since the whole core is covered by a low resistance copper winding, and this delays the saturation of the core throughout its whole length.

Thus we have the four types of relays.

1. The quick acting, quick to pull up and quick to release.

2. The slow acting, quick to pull up and slow to release.

3. The slow acting, slow to pull up and slow to release.

4. The sluggish relay, which will not operate with alternating current, is slow to pull up with battery, and slow to release. It might be added that where slow pull up is designated, the time delay cannot be noticed as easily as the delay on the release of a relay. Relays often become too slow in releasing due to dust accumulating on the end of the core nearest to the armature. Small particles of iron thrown off in the wear of service will gather at this point, and will build up a small bridge between the armature and the core. A piece of one-half inch twill tape pulled in between the armature and the core, with the armature pressed in will usually remove any foreign material. If this does not do so, dip the tape in some carbon tetrachloride and then pull it up and down between the armature and the core. This will usually clear the worst cases of a sticking relay armature.

In our next chapter we will discuss the application of these relays to work in connection with a calling device connected into the circuit of a common battery telephone.

Ohio Retains Its Supremacy in Both Attendance and Enthusiasm

The attendance at the Ohio state convention April 16-18 was in every way up to the expectations of those having charge of the arrangements. More than 1,250 persons signed on the dotted line at the registration desk.

Directors were elected as follows: Frank A. Knapp, Bellevue; Dr. C. L. Jones, Athens; Frank I. McKinney, Columbus; E. G. Miller, Warren; George B. Quatman, Lima; G. W. Mannix, Greenville, and C. B. O. Murphy, Columbus, president Standard Public Service Company. With the exception of Mr. Murphy, the board remains as heretofore. The board of directors then re-elected J. Warren Safford, Troy, president; Harry Sotzen, Shelby, vice-president; Frank L. McKinney, Columbus, secretary and treasurer.

Many interesting subjects were discussed during the three days of the convention and the banquet put the finishing touches on one of the largest gatherings of state meetings ever held.

President Safford's annual address summed up the situation in his state, and his address covers conditions in many other states as well. Following are some of the extracts from his address:

"Scores of companies have changed owners since April, 1928, and the trend toward fewer and larger units in our field has become so pronounced as to forecast centralization of the large majority of Independent companies in the hands of a few strong companies.

We note with regret the passing from the field of many of the men and women with whom we have been associated during more than a quarter of a century. This regret is somewhat tempered with satisfaction upon observing that they carry with them a reasonable financial reward for the years they have spent in building up the properties they have recently sold.

Upon behalf of the Ohio Independent Telephone Association, I again extend to the newcomers to our state a hearty welcome and a pledge of cooperation and assistance in every effort looking to the furnishing of a better and more necessary public service.

The new operating groups, without a single exception, are maintaining their memberships in the state association, and have expressed their desire to continue and to promote the effective organization of the Ohio Independent telephone group.

There has been a great deal of discussion, pro and con, with regard to the sale of various telephone properties. While our own plants at Troy and Tippecanoe City have not been sold, I am expressing the judgment of many of our Independent leaders as well as myself, when I say that these sales, mergers and consolidations of plants, and their centralization in the hands of larger groups, is apparently in line with a general world trend in business of all kinds. As a matter of fact this trend has affected us somewhat later than most other lines of industry.

In the electric and power field it has assumed majestic proportions; and it is either accomplished or gaining ground in the railroad, packing, grocery, drug, milling, baking and other widely dissimilar lines. In fact, I do not know of any business that is not subject today to the influence toward ever larger units.

I cannot fail to comment upon the fact that wise companies are building with fireproof and semi-fireproof construction. During the year we have had several disastrous fires that emphasize the need for more buildings of a flame-resistant character. Cheap and flimsy construction has seen its day in the telephone business, along with poor construction materials and inferior supplies and equipment.

Our improvement with regard to outside plant has likewise been continuous and substantial. Hundreds of miles of new underground have been completed by the companies, and a large amount of aerial wire replaced with lead-covered cable. Pole lines have been gone over carefully in practically every nook and corner of the state.

For the year 1929 I can forecast with certainty a still larger program of expenditure that will call for new millions in investment and furnish employment to many men and women throughout the state. No exact figures are available as to the amount of work that will be done, but various persons have estimated that anywhere from 30 per cent to 100 per cent more money will be spent for new plant and in plant replacement than was spent last year.

When your company does its spending, I would like to ask that you remember the telephone manufacturers and jobbers who are associate members of the state association, who exhibit their wares at the state convention and who advertise them in the telephone trade publications. These live-wire companies have a greater interest in you than any one else; and I am confident you can buy from them for the same or for less money than you would be required to pay concerns that do not specialize in service to the Independent telephone field.

In looking to the immediate future of

our industry, I am more optimistic than it is easy for me to express. We have always believed that the telephone industry was a good business in which to be engaged. I am convinced today that it is the best and safest business in the country, and that the men and women who continue to make it their life work will reap an increasing profit, both from the standpoint of personal satisfaction in their employment and from that of financial reward for their efforts.

Telephony has grown to be one of the most attractive investments for capital. It is an industry with a strong appeal to the best of management and most capable of workers. Its importance in relation to our business and social life cannot be over-estimated. It is a growing and expanding field. What the future holds in the way of increased responsibility for our organizations we cannot even picture.

During recent years the best telephone engineers in the country have prepared charts and studies purporting to set up the increase that we might expect in toll business in specific territories and in the nation. They have set up similar studies covering local traffic. Then, experience has shown that the actual growth and increase in both local and toll business has so far surpassed these estimates as to make them appear ridiculous. Each year the general public is demanding vastly more in the way of quality and service.

Difficult as it is to keep pace with this demand, we must plan to measure up to the most exacting requirements, providing a still better service, more rapid if possible, but at all cost more efficient day by day."

The report of Secretary McKinney showed the association in good shape financially, and with a greater number of stations under the association than former reports showed. He reviewed the legislative situation and stated that nothing had been enacted detrimental to the industry at the recent session.

Other addresses were delivered by F. B. MacKinnon on the "National Situation"; A. M. Crichton on the "Telephone Company and Its Public"; David Morris on the "Human Elements in Our Business"; D. C. Cox on "Observations Upon Telephone and Other Subjects by a Native Son of Ohio"; Stanley R. Edwards on "Publicity in Independent Telephony"; John Brinker on "New Provisions in the Ohio Utilities Law"; Gustav Hirsch on "Service Extension Campaigns with Employe and Profession Participation"; H. E. Hagerman, on "Building to Defeat the Sleet Storm"; and J. O. Campbell of Norwalk, who told of the severe sleet storm in his section last year. He discussed methods for preventing the recurrence of such disasters by rebuilding in a way that so much strain will not be put on poles.

Holds Annual Convention

The Petroleum Industry, Electrical Association was organized at Fort Worth, Texas, in March, 1928, and just finished its first annual meeting at Tulsa, Okla., at the Mayo Hotel, April 15 to 17, inclusive.

The meeting was attended by twenty-eight representatives of the following oil and gas companies:

The Prairie Pipe Line Co., H. E. Browne, secretary, Independence, Kans.

The Texas Pipe Line Co., T. J. McMahon, president, Houston, Texas.

The Shell Pipe Line Corp., F. S. Leonard, vice-president, St. Louis, Mo.

The Oklahoma Pipe Line Co., C. E. Foster, second vice-president, Muskogee, Okla.

The Empire Companies, W. T. Bulla, treasurer, Bartlesville, Okla.

The Prairie Oil & Gas Co., J. M. Scheuber, Supt. Tel., Independence, Kans.

The Magnolia Pipe Line Co., A. J. Balcom, Supt. Tel., Dallas, Texas.

The Texas Pipe Line Co., Oklahoma, H. J. Raymond, Supt. Tel., Tulsa, Okla.

The Humble Pipe Line Co., R. M. Bayless, Supt. Tel., Houston, Texas.

The Marland Oil & Refg. Co., F. C. Baker, Supt. Tel., Ponca City, Okla.

The Pure Oil Co., H. C. Miller, Supt. Tel., Pittsburgh, Pa., First National Bank building.

The Pure Oil Pipe Line Co., F. H. Groves, Supt. Tel., Tulsa, Okla., Box 2007.

The Sinclair Pipe Line Co., D. R. Welch, Supt. Tel., Tulsa, Okla.

The Standard Pipe Line Co., Inc., Morris Chambers, chief electrician, Shreveport, La.

The Lone Star Gas Company, Grover Reed, Supt. Tel., Bowie, Texas.

The transactions of these annual meetings outside of our banquet are of a closed and private nature, but they are for mutual benefit and for the betterment of electrical and communicating systems. They are getting together on standardization of material, in line construction, on rental rates, future rights of way, salaries, transportation, and everything pertaining to communicating systems from the main offices to the oil pumping stations and gaugers in the field. The above named companies represent approximately one hundred fifty thousand miles of telegraph and telephone communication.

The same set of officers as named above were re-elected complimentary to their good work of the past year. The meeting was concluded by a very fine appointed banquet at the Mayo Hotel which was presided over by President T. J. McMahon, who acted as toastmaster.

Numerous speeches were made and papers read for the good of the order. The next meeting will be held in Dallas, Texas, the third Monday of April, 1930.

Each company is entitled to two representatives.

District Meeting at Fort Wayne, Indiana

The spring meeting of the Northeastern Indiana Telephone Association, held in Fort Wayne, April 11, was the most successful in many years. More than 175 telephone men and women of northern Indiana were in attendance.

P. J. Maloney, of Columbia City, manager of the Whitley County Telephone Company, was re-elected president of the association. Other officers chosen are as follows: C. W. Morse, manager of the Steuben County Telephone Company, vice-president, and Martin Umbach, toll commercial superintendent of the local company, secretary-treasurer, re-elected.

Speakers at the luncheon were: Henry Barnhart, of Rochester, president of the Independent Telephone Association of Indiana, and Frank E. Bohn, president and general manager of the Home Telephone & Telegraph Company. Entertainment was furnished by the Home Telephone Athletic Association orchestra, chorus and quartette.

For the afternoon, the sessions were led by W. H. Beck, secretary-treasurer of the Indiana Telephone Association; Dr. E. J. Barland, manager, scientific equipment division, Graybar Electric Company; Frank X. Staub, of Fort Wayne, and C. L. Miller, plant engineer of the Indiana Bell Telephone Company.

Good District Meeting Reported at Lincoln, Ill.

A large attendance was reported at the district meeting of the Illinois Telephone Association which was held at Lincoln, Ill., during the latter part of April. About one hundred registered at the meeting. A large number of exchanges were represented.

The convention resolved itself into two sections: One representing the plant department and the other covering the operating school or traffic section. Members dined with the Kiwanis Club at lunch. At the noon luncheon A. J. Parsons of Springfield, secretary of the Illinois Telephone Association, delivered an address covering the work of the association in his state.

Other important subjects were discussed at the meeting.

During the year 1927 there were 777,144 telephones added to the existing systems in the United States.

Possibilities of Program Service

By R. S. BREWSTER

Vice President, Program Service Co., Lincoln, Neb.

A demand that is almost world-wide in its extent exists for the distribution of radio programs over telephone lines and cables into the homes and offices of listeners. In the United States this need is being met by approximately fifty radio program companies, operating in conjunction with independent telephone corporations, using their excess and idle facilities to carry radio programs to loud speakers located wherever convenience or necessity dictates. It had its origin in the discovery that it is utterly impossible to receive programs with a radio set in certain localities, and that even under average conditions these are interrupted and interfered with by changing atmospheric environments.

Naturally this new development, linked as it is with the always pressing need for added revenues, has aroused great interest in the ranks of the executives and managers of telephone companies, and like any new art or invention it is being much discussed, both favorably and unfavorably. If it can be properly linked with the telephone industry and become a utility worthy of a place in our great social and economic life, those who develop this service will be well paid for their efforts.

In presenting the subject insofar as development has taken place, it is well to keep in mind that what is being done today may not be considered good practice tomorrow. If the principles of this new art are not well founded, it will fall by the wayside. If what is offered meets a genuine need it will, since the business of transmitting radio programs is closely associated with the art of communication by telephone, development into a revenue producer, and fit with precision into the service-giving business of telephone companies. It is, in fact, the newest development in telephonic communication since it offers the only present day means of linking together Europe and America.

The underlying principle is universally recognized by radio engineers as is evidenced by the fact that many broadcasting stations are linked together with telephone wires. It is both an admission and a recognition that by itself radio reception is not so dependable as telephone communication and that the best results can be obtained by having the two function in combination. This process of linking stations together has created a new desire within the mind of listeners. They no longer care to pick up the distant station which cannot be held for any length of time without fading or static interference. They are interested in good clear programs.

It is at this point that the program service companies step into the picture. What they have to offer will not satisfy every radio listener. There will still remain many who desire the freedom to pick their own programs and to change instantly when they tire of what they are hearing. On the other hand, many who look to the radio to supply them with entertainment and who do not care to spend the time necessary to keeping the set up or adjusting the volume will turn with satisfaction to a service that offers them what they want and programs selected with care and with due heed to what the average person likes.

A program service speaker finds a very welcome place in the private clubs of the land, in hospitals, hotels and state institutions. They are popular there because they require no attention on the part of employes. What they want is a program, and if the program company does a good job in making its selections there is no complaint on the part of the listener.

Radio speakers located in the workrooms of factories, laundries and institutions where employes are grouped in large rooms, doing manual labor where it leaves the mind comparatively free, are meeting with much favor. If the work is of such a nature that undivided attention is not required, this service tends to reduce the working time within their own minds and should give some educational features that are very beneficial. Industry is always interested in anything that will reduce the monotony of work that constitutes its greatest menace, and here the service offered by the program company fits into modern thought and practice.

In the hospitals program companies install head phones at the bedside. This is done primarily to avoid annoyance to patients in adjoining rooms. Doctors are in general agreement that this is a very beneficial adjunct to hospitals. The benefit derived is that it takes the patient's mind off of his condition and shortens the time of the convalescing patient.

The management of hotels in the metropolitan cities have been experimenting with radio in guest rooms and have tried different methods. Some hotels are furnishing radio sets in guest rooms. These sets are equipped with a coin slot admitting a 25c piece, and the set will operate for thirty minutes with each deposit. Other hotels are furnishing radio headsets in the rooms. Other places are furnishing loud speakers. We have just completed an experiment with loud speakers in hotel guest rooms and find that after several months of service they become very popular and the hotel managements have received many favorable reports from their guests and no complaints from guests in adjoining rooms; however, the service is turned off at midnight. We are of the opinion that the program service system is the ideal solution for hotels.

In the metropolitan areas, it should be noted, there is an added interference which makes it almost impossible to give a good clear program through the medium of the radio alone. The operation of X-ray machines, vacuum cleaners and other electrical appliances create disturbances in the radio frequency range that are fatal to good reception.

Here lies a field outside that which radio can serve that beckons invitingly to the telephone companies of the country. It is a need that the radio cannot, in its present or perhaps possible stage of development, meet since it must use the air as its medium and be subject to its changing qualities. It is my belief that the program service system can supply this demand, and with profit to the telephone companies. It offers a very timely solution for added income—always welcome. It provides a way to use idle facilities that the telephone company has never been able to realize a return upon. Where the equipment is maintained by the telephone company for the program company it also provides a more economical distribution of labor, supervision and overhead. I am also quite sure that a well managed program company will improve telephone company public relations.

The Future of the Industry

The future of the program service industry is naturally difficult to forecast. It may, however, be set down as very certain that there will always be a demand for this service providing the following conditions are met.

(a) Like any other business, it is very important to move along with new ideas and developments, and this is particularly true of the radio business, for the reason that development in radio has been unusually rapid during the past two or three years. In other words, a program company that expects to be successful cannot install speakers that were considered up to date three years ago, nor can

they tolerate the overloaded amplifier that still exists in some of the operating companies.

(b) The quality of reception and service must be constantly studied and improved upon, keeping in mind at all times that there is room for improvement.

(c) All of the pioneering development of program service systems has been on the single channel basis. During this pioneering development the single program has been entirely satisfactory. However, the time is rapidly approaching when we can no longer operate on this basis. The public is not generally demanding this service, but we are certain that it is entitled to it, and that it is only in line with future development.

(d) It is highly important that program companies provide themselves with a proper personnel. Since there is a great deal of experimental work to be done, it is important that a highly specialized radio can be made a part of the personnel of the program company. A very careful selection of studio announcers must be made. They should, if possible, possess a general knowledge of music in addition to having a good radio voice, a pleasing personality, and a good education. The program director should have all of the qualities of an announcer and in addition to this some advertising ability.

(e) The program, which is of vital importance since it is the only product the program company has to sell, must be constantly improved upon. There are only a comparatively few broadcast stations in the United States producing good outstanding programs, and the tendency is to fewer programs and more broadcast stations linked together. The chain program plan tends to produce better programs and better reception, and represents the ultimate plan for program companies where they may receive in a similar manner non-advertised programs from a centralized point distributed to the various companies by wire, bringing into the home the nation's greatest artists sponsored only by the program companies and the expense of which is included in the speaker rental.

In addition to the above plan it is highly important that program companies provide certain of their own programs. The mechanical record programs have met with much favor and should be a part of the studio equipment of every organization. By carefully selecting the records the studio announcer can give the listeners all of the modern and classic music of the day.

Provision should also be made so that local programs may be picked up by remote control and distributed over the wires of the program company to the community in which it originates. Program companies in the larger cities should provide a downtown studio to take care of any local programs of sufficient interest to warrant its use.

Foreign Development of Program Service Systems

I have been in communication with radio engineers in Germany, England, Holland and France, and it is interesting to note the development that has been made in these countries. The last report received from England indicates that the art is developing very rapidly, several thousand speakers being already in service. It is the general belief that within a very short time the entire British Isles will be equipped with this service, both on land lines and the lines of the Post Office Department. In the last letter received from England one engineer says, "We can assure you that the special facilities the service offers to the public will be acclaimed the ideal means of enjoying perfect broadcast programs without trouble. There is no tuning in; to listen in you simply press a button." This plan provides for separate program service wires.

In Paris and Munich companies are employing radio systems in the furnishing of grand opera to any telephone subscriber desiring the service. This service is known as "Theatrophone" and is distributed through a separate switchboard exchange. A subscriber desiring the opera or program so indicates his desire to the Theatrophone Company, which, in turn, picks up the subscriber's line, disconnecting it from the telephone central office by means of a jack and sends the program direct over his existing telephone wire to the loud speaker, which he at the same time connects to his telephone line in the home. If during the period when he is receiving the program he desires to make a telephone call he presses a button on the speaker, which in turn lights a lamp on the Theatrophone exchange switchboard. He states his desire and the operator immediately disconnects the program. The same procedure exists on an inward call, except that the operator challenges the incoming call in an effort to ascertain whether or not it is of sufficient importance to disconnect the program.

The advisability of such a plan in this country is to be doubted. The only point in its favor apparently is the economic use of wire facilities which in turn would probably reflect a much cheaper rate to the subscriber of the program service. However, this cannot outweigh the disadvantage of interruption of telephone service.

The Hague in Holland, which employs an automatic telephone system, furnishes a similar service except that when the telephone receiver is lifted from the hook the program is disconnected. The program is likewise disconnected on incoming calls.

In articles to follow I will attempt to cover the subject of program service organization, types of equipment and systems, operation and maintenance, studios, programs, advertising, and rates.

41,000 Persons Run New York Phone System

With the largest number of employes of any single business concern in the city, outnumbering the combined police, fire and street cleaning departments by 9,000, an army of 41,000 New York Telephone Company employes stands by on twenty-four duty to render constant service to the hundreds of thousands of telephones in the city.

The magnitude of the organization and plant necessary to provide telephone service for New York City is displayed by figures furnished by J. S. McCulloh, president of the New York Telephone Company, showing that in several important respects the telephone service for the five boroughs is the largest single enterprise in the metropolis.

Telephone Company Adds New Quarters at Tulsa

Tulsa, Okla.—Growth in its business here has compelled the Southwestern Bell Telephone Company to remove its engineering department from the Pioneer building to the second and third floors of the old Oklahoma Natural Gas building at 117 West Fourth street. The vacant space in the Pioneer building will be utilized for expansion of switchboard facilities, according to E. M. Bruten, district manager.

A. T. & T. Asks to Launch $225,000,000 Bond Issue

The American Telephone & Telegraph Company is preparing to make a huge issue of bonds for refunding purposes and financing of expansion.

A special meeting of the company's stockholders has been called for April 30 to authorize the issuance of not exceeding $225,000,000 in convertible bonds for the purpose of providing for the payment of about $75,000,000 in collateral trust bonds, due July 1, 1929, and for new construction needed by the Bell system. The stockholders ratified the proposal to increase the authorized capital from $1,500,000,000 to $2,000,000,000.

L. S. Gardner, secretary of the Texas Independent Telephone Association, is wearing a pair of diamond studded cuff buttons, presented by the directors of the Texas association for faithful and efficient service during the years he has been secretary of that organization, and we'll say he deserved 'em.

Who's Who in the Telephone Business

H. W. HUBENTHAL

An Appreciation by J. A. Smith

In looking over the field of Independent telephony, especially in the Southwest, we do not see anyone standing out more prominently as a champion of the Independent telephone industry than H. W. Hubenthal, telephone engineer for the Oklahoma Utilities Association, under which name the telephone interests of Oklahoma carry on their activities.

Leaving his home in Bremen, Germany, at the age of 13, H. W. Hubenthal became a sailor on the seven seas. Serving on sailing vessels and tramp steamers for three years as deck hand and coal passer, "Hube," as he is familiarly known to the telephone industry, after visiting many foreign and American ports, quit the sea at Galveston, Texas, and started his career in the telephone game. Beginning at the very bottom (as a hole digger) Hube went through the school of hard knocks and steadily rose to lineman (top) auditor, superintendent, telephone engineer and general manager, serving with companies in Texas, Arkansas, New Mexico and Oklahoma.

"Hube" was appointed telephone engineer of the Oklahoma Corporation Commission in 1916, resigning in 1923 to become engineer to the Oklahoma Utilities Association, which position he holds at this time. His work with the Oklahoma Corporation Commission enabled him to better familiarize himself with the work of this branch of the state government, as well as the workings of similar commissions in other states. Through this experience he has been able to render valuable aid to the Independents of his and other states.

H. W. Hubenthal, Telephone Engineer to the Oklahoma Utilities Association

His work with the commission was so pleasing to the telephone interests of Oklahoma that in 1923 he was offered a place with the Oklahoma Utilities Association as engineer to the telephone division, and as his heart had always been with this work he gave up the political job he had held through more than one political upheaval in that state where governors are impeached with impunity, and seems to have a life job with the people he has served so well.

With a record of nearly thirty-five years in the industry, "Hube" has attended telephone conventions in many states. He has not missed a national convention of the telephone interests in twenty years.

"My motto is treat 'em square and maintain peace, even if you have to fight for it," said Hube, when asked for an expression of his telephone philosophy.

"Hube" is a member of the Masonic and the Elk fraternities, the American Association of Engineers and Independent Pioneer Telephone Association of the United States.

American Telephone & Telegraph Co. to Offer $225,000,000 Bonds to Public

The financial pages of the daily newspapers on May 1st carried the following announcement:

In one of the largest bond offerings since the war the American Telephone company cut a melon worth about $106,000,000 in the form of purchase rights to stockholders.

The American Telephone stockholders authorized a new issue of $225,000,000 convertible 4½ per cent bonds. Then the directors announced that $219,000,000 of the bonds will be offered to stockholders of record May 10 at par in the ratio of $100 in bonds for each six shares of stock held. This issue of bonds has not been underwritten by any banking syndicate, but will be handled by the company direct with its stockholders.

Convertible Into Common

The bonds are convertible into common stock at $180 a share in 1930, at $190 a share in 1931 and 1932 and at $200 a share from 1933 to 1937, inclusive. At market price of around 234 for American Telephone stock the privilege of converting bonds into stock at 180 next year would figure to be worth about $8.23 a share on the common stock. As there are nearly 13,000,000 shares outstanding the total value of the conversion right would be worth around $106,000,000 to the stockholders.

But there may be even some addition to the value of the melon. If the bondholder exchanges his bonds for stock and there is a balance in bonds, he may take an additional share by paying the difference between the balance on his bonds and the conversion price of the stock. The bonds will be dated July 1 and will mature until July 1, 1939. They are redeemable until 1938 at 105 on sixty days' notice and thereafter at par. This is the first offering of bonds by the American Telephone company since 1925, when about $125,000,000 of 35 year 5 per cent debentures were sold. Since then the company has financed itself by offering stock to stockholders. The proceeds of the present bond issue will be used to pay off $75,000,000 of collateral trust notes maturing July 1 and for the construction program of the Bell system, which is understood to include the proposed trans-Atlantic cable.

Fayette Home Phone Sold for $4,000,000

The sale of the Fayette Home Telephone Company to the Patterson, Copeland & Kendall Company and Geo. W. Thompson, of Chicago, for approximately $4,000,000, was announced Thursday with the organization of the Lexington Telephone Company, which will operate the Fayette and two other central Kentucky companies, beginning April 1.

Including the transfer that will be made are the Woodford Telephone Company, operating exchanges in Versailles and Midway, and the Jessamine Telephone Company, of Nicholasville. Both companies are controlled by the Fayette Company.

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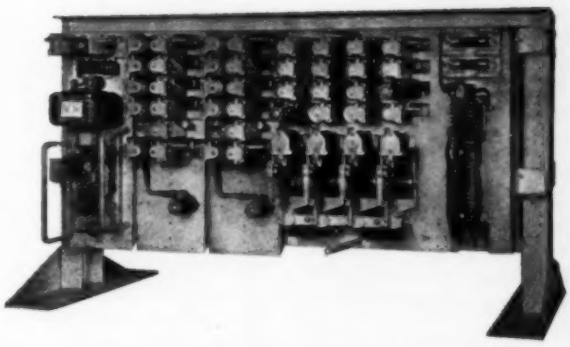
e growing among progressive telephone companies owger P-A-e to business and industrial telephone r P-A-X o subscribers a fully automatic interior ilities for trunk connections to and from the . It also o the telephone company attractive r profit.

new Type 10-B P-A-X, illustrated here, particular interest to telephone com-ies, because of its small capacity and pact design. It is built of standard owger parts, employs no push buttons all calling is done by means of the dial ccordance with modern telephone prac-. The excellent service it renders permits telephone company to establish rates ich are both acceptable to the subscriber profitable to the company. Write for strated circular.



The Type 10-B P-A-X

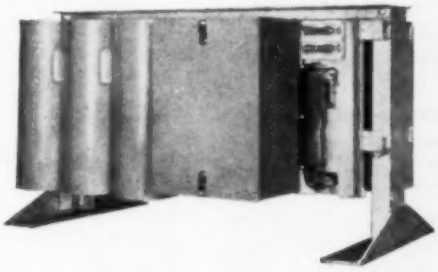
Consists of a small automatic switching unit, a neat attendant's cabinet with "built-in" Monophone, and a small storage battery.

Uses standard automatic, central battery telephones—either monophones or old style instruments.

Only two wires to each telephone. No cables or complicated terminal boxes.

Capacity, nine local lines, two trunks, (wired for three).

The illustration above shows the switching unit; the one below shows the same unit with the dust covers in place.



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OWGER AUTOMATIC
ELEPHONE QUIPMENT

Prevention and Corrective Maintenance

By D. C. HOSFELD,

Plant Results Engineer, American Telephone and Telegraph Co.

The scope of this talk is confined to the maintenance of the telephone plant, from the standpoint of those in the organization who are responsible for both the preservation of the property and the furnishing of the kind of plant service that is pleasing to the subscriber.

First, let me say that the design and construction of the plant have a profound effect, not only on the subsequent maintenance effort required, but on the service results. I am not going into these features of the problem at length, except perhaps, to say that an extra dollar applied in design, engineering, construction or installation, in many cases, will pay its way in lessened maintenance effort or service reactions.

In my talk with you, I shall assume a well designed and properly constructed plant and that its proper maintenance consists largely in doing those things which will keep it in practically the same service condition as when newly constructed.

It might be asked why maintenance is necessary if the plant is well designed and properly constructed. The answer is that the wear and tear caused by use, exposure, natural decay, accidents, etc., all operate to make continuous care necessary, if the best results are to be obtained, just as is the case with your automobile, or the house in which you live.

Of course, the grade of maintenance depends, to a large extent, on the ideals of service which have been established and, in general, these service ideals have been commendably high.

If telephone service is to be satisfactory it must be practically free from interruption. To accomplish this the plant must be so designed, constructed and maintained that it will be highly resistant to such trouble-making conditions as usage, storms, extremes in temperature, accidental breakage, etc.

Also, if conversation cannot be carried on easily and distinctly the service can hardly be considered as meeting requirements. With the increasing use of smaller gauge cables, the increasing distances over which connections are established and the more frequent demand for such long haul toll service, the problem of proper design, and the subsequent construction and maintenance of plant from a transmission standpoint, has increased in complexity and there is every indication that this trend will continue.

Preventive and Corrective Maintenance

Maintenance naturally divides itself into two parts: "Preventive" and "Corrective."

"Preventive maintenance" is the term generally aplied to the work of clearing toward the discovery and correction of conditions which may later cause service interruptions or difficulties. Examples are the periodic inspection and repair or outside plant, routine tests of central office equipment, etc.

"Corrective maintenance" is the term generally applied to the work of clearing those troubles which do occur and which have been brought to our attention through reports from subscribers, operators, or others.

Between these two types of maintenance effort, there is a point of proper balance. On the one hand, preventive maintenance will materially improve the grade of plant service but, if carried too far, it will be too costly for economic operation. On the other hand, if only corrective maintenance is done, a lowered grade of service is bound to follow, which will surely end in maintenance and other costs higher than with a reasonable preventive maintenance program. This result may seem somewhat paradoxical; however, experience has taught us that, over a period of years, a high grade of maintenance (which means a proper proportion of preventive effort) is no more costly than a poor grade, and, of course, the service rendered to the subscribers is better.

Central Office Maintenance

In going into the more detailed discussion of the maintenance problem, perhaps the central office should be considered first, for it is the heart of the telephone plant. Of the many new developments and changes in the art during the last few years, those relating to the central office have probably been the most outstanding. The significant feature, of course, has been the introduction of the dial system on a large scale. The problems incident to this change have been many and varied; they have involved substantial additions to the force, the training of both the working and supervisory forces in a new technique, together with numerous changes in station and private branch exchange equipment and higher requirements in the outside plant.

Preventive Central Office Maintenance

We find central office equipment particularly responsive to preventive maintenance treatment. Being accessible, well housed and not often exposed to extraneous hazards, maintenance methods designed to keep it functioning constantly at a high level are particularly effective.

Cleanliness is imperative. Not only should the equipment be kept clean but floors, framework, cable runs, etc., should be maintained in a dust-free condition. Primarily, this is to prevent dust and dirt from causing equipment trouble but there is ample evidence that the effect of clean, well kept surroundings on the morale of the forces is sufficient to justify it for that reason alone.

Periodic inspection and test of practically all central office equipment is a necessity. Definite instructions, carefully written so as to describe in detail the manner in which tests, inspections and repairs are to be made, are one of the first essentials in successfully carrying out this work. Of almost equal importance is a plan for the systematic scheduling and assignment of work to be done. Without such a plan it is difficult to get the tests or inspections regularly made or to know the results when such work is properly done.

In the manual offices, plugs and jacks are commonly the cause of many troubles. Plugs become dirty, bent or worn; conductors become crossed and plug shells loose or defective. Jacks become loose on their mountings, their sleeves may wear excessively, or the springs become out of adjustment. Most of these troubles cause serious service reactions. A plug which is bent or worn too far, particularly when used with a worn jack or one with springs out of adjustment, may cause a cutoff or an annoying interruption. Standards for wear and adjustment have been established for most types of plugs and jacks and definite methods and equipment are provided for making periodical tests and inspections. It may also be of interest to know that dirty plugs are a rather important factor in transmission losses and, as a result, it has been found advisable to have schedules so set up that cleaning is done regularly. During the summer months, in certain parts of the country, this is required as often as once each three weeks.

Cords gradually wear and the conductors may become noisy and cause serious service impairment unless weeded out by frequent inspections. Defects in keys are also common trouble items. Key tops and handles break, key handles work loose, plungers get dirty, causing keys to stick or work hard, straps sometmes break, key contacts get dirty and springs

*A paper read at Telephone Plant Conference, Purdue University, March, 1929.

work out of adjustment. These items readily respond to preventive maintenance effort.

Relays, particularly those required to operate within marginal limits, have required considerable attention. On relays operating on relatively small margins, the accumulation of a foreign substance on the armature and the pole pieces or adjusting back-stop nut or screw has been an outstanding cause of trouble. Among the most successful means used to overcome this difficulty have been cleaning of the parts affected by either a strip of paper or cotton tape, and the use of a flexible stop-spring on certain types of gravity relays.

Careful and painstaking adjustment of relays has resulted in a material reduction in trouble. In addition to adjusting the relays on a current flow basis, definite mechanical requirements have been set up which cover, among other items, contact pressure, spring follow-up and contact separation. Adjustments made in accordance with these requirements are such that satisfactory operation is assured, within certain limits, under adverse conditions, as well as under the ideal.

In all offices, the quality of work on the distributing frames is a matter of real import. Often large turnovers in stations occur, rearrangements of load are required and cable transfers are made, resulting in a considerable proportion of the cross-connections being worked on in relatively short periods. Taking care to see that lines are not worked on while busy, that they are kept out of service the shortest possible time, that momentary contacts, drops of solder, or ends of wire on other working lines are avoided, and that the work when completed is of a particularly high grade, are features essential to keeping service interruption from this source at a minimum.

In connection with the supervision of all this work, sampling checks of equipment conditions or performance are a valuable aid. Preferably, they should be made by others than the regular force, so that errors in methods or procedures may be more readily detected. Usually such work consists of applying to a small percentage of the equipment the same routine tests as are made by the regular forces.

Corrective Central Office Maintenance

While corrective maintenance is a decreasing factor, there is undoubtedly a point beyond which further reduction in troubles may only be secured by an expenditure of preventive effort which in our present view might be out of balance with results. However, this point has not, as yet, been reached.

Trouble reports received at test desks should be promptly analyzed and immediately referred to the central office force when central office equipment appears responsible. It has been found desirable in large offices, to record reports so that the clearance time can be checked and so that those on which no trouble is found can be accumulated to permit analyzing for a possible common cause.

Trouble reports from subscribers, operating forces and observers should be continuously studied as a check against the adequacy of preventive maintenance effort and to discover those instances where preventive maintenance effort is, in itself, contributing to service trouble.

It is of prime importance that standard methods of correction be applied to defects and that adequate and accurate records be maintained to permit analysis of the results.

Maintenance Information and Tools

In order that the methods of performing the various maintenance operations may be systematic and uniform it is necessary that there be readily available to each man the current standard sources of information which relate to his work. Methods for disseminating such information must include means for ensuring replacement of superseded instructions and for distributing new information promptly.

In order to ensure the use of the proper tools, each man must be provided with the small tools for which he has common use, such as spring benders, relay gauges, etc., and there should be adequate provision of less frequently required and larger tools and of testing equipment. It is essential that tools and test sets be well maintained. Gauges, meters, resistances and similar equipment may become damaged or get out of adjustment, thus introducing wrong testing conditions, which will cause service reactions.

The above remarks relate chiefly to the problems of the manual type office. The introduction of the dial system appeared to present new problems because of unlike apparatus. However, we have found little new in the fundamentals of maintaining such offices. Both types are required to be kept clean both employ relays and other apparatus having many similar characteristics and requirements, and both have distributing frames and power equipment of a very similar nature. Because of this, I believe there would be little gained by going further into the dial type of central office equipment.

Exchange Outside Plant Maintenance

Turning now to the exchange outside plant, we find that, from the standpoint of investment, it bulks large, with respect to the total plant. Constructed, as it is, largely in or on the highways, and because it is subject to various kinds of extraneous interference, the problems surrounding its maintenance are numerous and somewhat difficult.

In general, the requirements to be met in constructing new plant may be considered as established by the current specifications. However, in the matter of locating plant, so as to reduce its hazards, there are doubtless many opportunities to select locations which offer considerably greater safety from interference than the minimum specification requirements and to secure this added insurance at little, if any, additional cost. While each case must be considered on its own merits, with due regard to the cost features involved, a rather liberal view should result in a plant more free from trouble-making factors, and making for ultimate economy.

Generally speaking, the maintenance objective is to keep the plant as nearly as possible up to its original specification requirements. Adequate strength in pole lines is of primary importance and this, of course, requires proper initial design with respect to spacing and size of poles, as well as maintenance methods which will thereafter preserve a proper factor of safety. On the larger poles, periodic ground line inspection for decay and measurement of the remaining sound wood, together with prompt replacement, resetting or reinforcement of those poles found weak, have proven an economical means of insuring satisfactory pole line strength. On the smaller poles, periodic tests for strength with a pike pole, equipped with a special compression gauge, have accomplished the same result. Without such inspections and tests, pole line strengths become an uncertain and unknown factor, and poles may suddenly give way under the stress of storm conditions, causing widespread damage. Because of economic limits it has, of course, not always been found practical to build lines, particularly those carrying open wire, to such a strength that they will withstand all storm conditions which may be encountered. Bu the more severe storms do not occur frequently, so that the margins of safety have generally been found satisfactory.

(This interesting discussion will be concluded in the June issue.)

New Yorkers to Meet at Rochester May 22nd and 23rd

The Up-State Telephone Association will be held at the Seneca Hotel, Rochester, N. Y., May 22, 23 and 24, according to announcement of Mr. J. G. Ihmsen, president of that association.

New York conventions are important, but Mr. Ihmsen desires to impress upon those in New York the importance of this meeting, as he considers this meeting of more than usual interest.

Development of the Modern Ringing Equipment

By F. J. DOMMERQUE
Fellow A. I. E. E.

Telephone signals are of two kinds, audible and visible. The audible kind consists principally of the ringing appliances to call a subscriber. Audible signals serve also for alarm calls, where they are required to call the attention of an attendant in the exchange to a visible signal, which is functioning at a place out of the vision of the attendant. They are also used to give an alarm when a protective device has operated, etc. The test an operator makes on a multiple board by placing the tip of a plug to the sleeve of the jack of the line to be tested, to ascertain whether the desired line is free or not, is also to be considered an audible signal, as the operator knows when she receives a click in her ear, that the line is busy. In the class of audible signals belong also the various tone producing devices, which are used not only to give signals but also to permit of distinction between the signals so as to enable the listener to know by the tone what the signal is to signify. The best known of these signals is the busy signal the subscriber receives when the desired line is busy.

A tone test is used at the exchange, for instance, when the recording operator at a tollboard wishes to keep the local subscriber waiting on the line in case the desired toll connection can be obtained quickly; she orders the switching operator to go into the multiple jack with the tone test on it. The switching operator in doing so hears the tone and knows that she is connected to the proper party and puts up the connection.

In very small exchanges with not more than 100 or 150 subscribers a hand generator is mostly used to develop the ringing current, which, however, has been found a cumbersome and time consuming process, therefore pole changers have been produced for straight and party line ringing, which have been fully described in two papers by Mr. Higgins on "Central Office Ringing Equipment Analyzed" in TELEPHONE ENGINEER of April, 1926, and "Types and Care of Central Office Ringing Equipment" in TELEPHONE ENGINEER of May, 1926; therefore there is no need to go any further into a description of these two types of ringing current producers, it may only be mentioned that for small exchanges magneto-ringing-motorgenerators have been employed, consisting of a motor direct-connected to and mounted on the same bed plate with, a generator built up from a number of as many as ten good-sized horseshoe magnets.

Both the magneto generator and the pole changer furnish alternating current.

In medium size and large exchanges ringing machines are in use exclusively. The common practice is to provide one motor generator for regular work and a generator driven from the storage battery as a reserve in emergency. We will say something about these machines presently, but first we will give the most simple arrangement of a ringing circuit. The alternating current produced by the ringing machine is connected to the line by a key; after the connection to the desired subscriber's line has been effected by means of a plug and jack, the ringing current starts to sound the subscriber's bell. The illustration of this circuit in Fig. 1 is a diagram which not only shows the operation but also indicates the symbols convenient for drawing up a ringing circuit. The alternating current producer is shown by a ring, which represents the commutator rings of the machine, and by the brushes. The sign inside the ring is the abbreviation for frequency. The frequency of the alternating current in these machines ranges for direct line ringing from 16 to 25 periods per second. In the Bell system it usually is 20 periods and in Europe mostly 25. The subscriber's station in this diagram is indicated for sake of simplicity by a transmitter and receiver in series, although in actual practice they are not as connected; but this is immaterial for ringing; the ringer, however, is permanently bridged across the line. As the ringers are to be operated by alternating current, they must be polarized as fully explained by Mr. Higgins. The frequencies used for four party line harmonic ringing are mostly 16, 33, 50 and 66 periods per second, (these numbers are used instead of the more accurate numbers of 16⅔, 33⅓, 50 and 66⅔ periods or, as the more popular term is "cycles" per second). The principle of the harmonic ringing has been explained by Mr. Higgins for the production of the ringing current by means of a pole changer, and what he says holds equally true for a harmonic ringing generator having four armatures on one shaft and a speed regulator at the end of the shaft to keep the machine running at 1000 revolutions per minute so as to produce the current at 16⅔ cycles per second by one of the armatures placed between two pole pieces, 33⅓ cycles per second by the next armature placed between four pole pieces, and 50 and 66⅔ cycles per second by the third and fourth armature respectively, placed between six and eight pole pieces.

It will be noticed from Mr. Higgins'

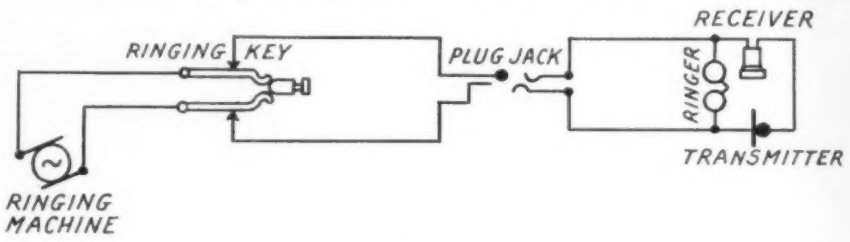

Fig. 1

illustration of the harmonic ringing circuit that all four ringers on a line are placed in series with a condenser across the line. This is the case also where only one ringer is placed across the line in straight or direct ringing, wherever a common battery is used at the exchange, to prevent this battery from flowing through the ringer in normal condition as a condenser will not permit direct or continuous currents to pass, but only alternating currents.

Mr. Higgins also explains the method of two-party line ringing by pulsating current, and the multi-party line ringing or code ringing by a combination of long and short rings following in that respect the Morse code in telegraphy. It would be waste of time and energy to recapitulate what he has said so ably.

Attention may now be called to a ringing circuit, which is frequently designated as an *automatic* ringing circuit, although it is only a semi-automatic circuit because the operator has to set the ringing button first, before any action can take place.

In Fig. 2 a ringing key or button is shown connected to the one end of the

winding of a ringing relay with three contact sets, the other end of the winding being connected through a resistance to the negative pole of the common battery, the positive pole of which is grounded. When the operator pushes this key down, a contact is made with ground, and consequently the ringing relay will be operated over the circuit from this ground through the winding of the ringing relay, through a resistance and the battery to ground. The three relay springs are attracted and the inner contacts are closed, whereby three new circuits are established, namely first a "locking" circuit; that is, a circuit which would hold the ringing relay in operation even when the ringing key would be released and the ground contact at its spring opened, as the ground on the armature marked "a" would take its place. The second circuit starts from a ground at the ringing machine and passes over the interrupter spring at the time the projection on the interrupter disk closes the contact. The interrupter disk when revolving closes this contact once during each revolution and thereby causes an intermittent ring at the subscriber's station. The circuit continues from the interrupter spring to the ringing relay armature contact marked "b," passing on its way through a resistance R which forms a shunt to the winding of the trip relay, this winding and the resistance R being connected in parallel. From this contact "b," which is closed at this time, the circuit continues over the armature to the ring of the connecting plug and jack, over the one side of the line, through ringer and condenser at the subscriber's station, back over the other side of the line to the ringing armature and constant marked "c," which is now closed, to the ground on the battery.

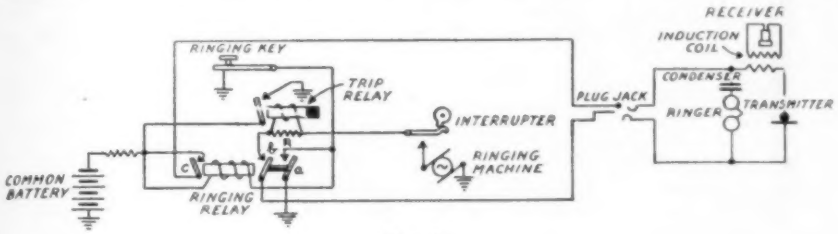

Fig. 2

The subscriber in answering the call lifts his receiver off the hook, which closes the talking circuit through the common battery. This battery current can not flow through the ringer on account of the condenser, but it flows through the transmitter and the low resistance side of the induction coil, over both sides of the line, over the armatures and contacts "b" and "c" of the ringing relay, from the armature contact "b" on the one hand to ground on the ringing machine passing on the way through the trip relay and its shunt; from the contact of armature "c" on the other hand back to its origin. As will be noticed in Fig. 2 the trip relay core is provided at its one end with a copper sleeve; this is done to make the relay "slow-acting," the sleeve forming practically a low resistance short circuit equivalent to a turn of heavy wire, whereby the winding impedance is reduced to such a degree that a great amount of current can pass through the relay winding without pulling the armature up completely, only when the subscriber takes the receiver off the hook and thereby permits battery to flow over the line, will the trip relay armature close its contacts. A circuit is established from ground over the armature of the trip relay through a resistance and the common battery to ground. The ringing relay is thereby shunted in such a manner that it will not retain sufficient current to keep it operated whence it will release and thus interrupt the ringing circuit.

There are a number of these so-called automatic ringing circuits, the above example may suffice as an illustration.

The 20-cycle ringing equipment discussed above was in connection with local exchanges. This equipment is also suitable for short toll lines as long as no composite work is done. Where, however, telegraph and telephone currents are superimposed it is necessary to employ a higher frequency which will not interfere with telegraph operation. The use of repeaters demands also a ringing system of this kind which will permit to pass the ringing signals around the telephone repeaters to avoid interference with the transmission. The best frequency for these purposes has been found to be 135 cycles.

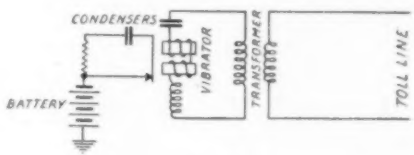

Fig. 3

There are also cases where a still higher frequency is necessary in modern toll and long distance work, which lies in the range of voice frequencies. Such a case is met with in carrier current operation, where "voice-frequency" ringing at 1,000 cycles is furnished. This latter case will not be discussed at present, but left for some future time when an opportunity presents itself for a discussion of carrier currents.

For the production of 135 cycle ringing current an interrupter may be used if the output required does not exceed three-fourths of a watt, otherwise a motor generator will be necessary. In Fig. 3 is given a skeleton diagram of such an interrupter circuit. The principal part consists of a vibrator, carrying in front of the magnet a reed, the contacts of which are in series with the battery circuit. This arrangement operates intermittently similar to the ordinary buzzer. The vibrator is connected to the toll line by means of transformer.

We now come to the motor-generator, wherein a great transformation has taken place in modern times contemporary with the trend toward unification, standardization and the cost reduction in manufacturing, simplification in installation and consequently less maintenance expense.

The ringing motor-generator of today is a compact piece of apparatus. The motor may be a continuous current shunt motor or an asynchronous alternating current motor. The generator usually has associated with it a transformer which forms a good balance coil for a three-wire continuous current system and the secondary of which can provide different voltages used with 20 cycle ringing by means of taps with which it is provided. From such a generator one can obtain 110 volts and 105 volts; also 85 volts and 77 volts for party lines. In the latter case small storage batteries are placed in series with the 85 and 77 volt taps of the transformer secondary to obtain the positive and negative superimposed currents.

It may be mentioned incidentally that the generator can supply also continuous current of $+110$ and -110 volts for control of the coin collectors, which was formerly furnished by batteries. In addition, the two voltages can be combined to furnish current at 220 volts for generator field excitation.

Upon the shaft of the Holtzer-Cabot ringing machine a tone wheel is mounted consisting of a solid metal cylinder insulated by a fibre ring from the metal hub upon which it is mounted. At regular intervals around the circumference of this cylinder insulation plugs are set in holes drilled for that purpose. The current from the battery is brought to the tone wheel through a brush which alternately passes over the metal and insulation surfaces, the interruptions per minute depending on the number of plugs. The common or return circuit is supplied by another brush which makes continual contact with the tone wheel. Directly from the tone wheel is produced a humming noise, which may serve as a *howler*, when the wire chief wants to

call the attention of a subscriber who has left his receiver off the hook.

In some cases, principally on European machines, the humming is produced by attaching to the end of the machine shaft two gear-wheels which rotate at a speed of 25 revolutions per second in the magnetic field of two horseshoe magnets. By passing the teeth and the openings between them alternately before the magnet poles a continuous humming noise is produced. One of the gear wheels has 18 and the other one 6 teeth, consequently the humming consists in one case of $18 \times 25 = 450$ and in the other case of $6 \times 25 = 150$ vibrations, giving a high and a low tone. This process may also be utilized for code ringing.

To return to the Holtzer-Cabot machine, the howler tone can be used for other signals such as trouble signal, don't answer, etc., taken directly from the interrupter commutator or through secondary interrupter springs. As many circuits as required can be connected through individual springs to use this tone. However, there is space enough on the motor shaft extension for mounting a tone wheel of sufficient width to provide a total of three different signaling tones having 8,000, 16,000 and 24,000 interruptions per minute, each one of which can be used through interrupter springs to serve as many purposes and circuits as required.

Interrupted current is also used for giving a *"flash signal."* Then the speed must be reduced so as to give the lamps a chance to flash. To obtain the necessary reduction a worm gear is mounted on the machine shaft, which gear operates another shaft at right angles carrying cams for operating make and break springs. In the leads to the negative pole of the battery relays are inserted, the armatures of which are alternately attracted and released, thereby flashing supervising lamps at the switchboard. If, for instance, a B-operator on test finds the called line busy, she will insert her trunk plug into a special busy jack, to which the brushes collecting low-speed interrupted current are connected. This interrupted current will operate relays controlling the calling supervising lamps at the A-board and thus give to the A-opertaor a flash signal indicating that the called-for line is busy. The calling subscriber receives the busy signal by a noise known to him as an indication of a busy line.

It is the rule to install a duplicate set of ringing motor generators. Each of the sets is provided with the attachments described. One of the two sets is run from the city mains, and the other one held in reserve in case the city supply should fail or the regular machine become disabled, is driven from the storage battery but normally it is disconnected from it. Whenever the power supply should fail, the battery-driven machine is put in service automatically by means of automatic relays and magnetic switches.

The tendency is to standardize the ringing motor generators so as to require fewer sizes and to obtain compact combinations. One arrangement found in many European exchanges is to place each one of the two machines on a shelf; the two shelves are then mounted upon an iron frame, the regular machine above the battery machine shelf, the latter being above the ground about one foot. In the upper part of the frame is located the panel for the switches, relays and signaling devices, the whole frame thus carrying the complete ringing outfit and forming a unit which can easily be shipped and installed.

Leakage Measurements

By W. C. WHITE

Wire Chief, United Telephone Co., Fredericksburg, Texas

The transmission of speech over long distances, and under varying conditions, by means of the telephone is one of the most notable achievements of all time. The character of the voice currents makes it necessary that the connecting circuits be so maintained that these currents will be confined, as much as possible, to the connecting lines and the instruments.

When leakage conditions are allowed to accumulate on these lines, a part of the voice currents will take an intermediate path from one wire to the other. The effect is that of a loss of a part of

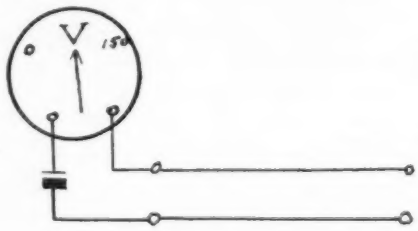

Fig. 1

the current put out on the line by the telephone transmitter Since these telephonic voice currents are very weak, leakage on the connecting line becomes a serious matter.

There is only one way to know the actual condition of a toll line, and that is to take a look at it once in a while with proper testing equipment and that should be done with regularity. The former practice in making insulation tests was to measure the insulation resistance of the line, using the megohm as the unit of resistance. The latter method consists of the measurement of the line leakage, using the milli-micromho as the unit of conductivity. As the two quantities above mentioned are the reciprocals of each other, they are determined by the same measurements. For the benefit of the student we might say that the milli-micromho is the one billionth part of one mho. One mho is the conductivity of any conductor whose resistance is one ohm. The milli-micromho is the unit of leakage, and one mile of line which has one hundred of these leak units has an insulation resistance of ten megohms per mile. It is preferable that the results of these tests be expressed in terms of leakage, as it is more useful in considering the balance of the circuits and is not so difficult to compute.

In order to secure accuracy, it will be necessary to use a voltmeter having a high resistance, preferably 100,000 ohms. It is important also that a fairly high testing voltage be used, the present standard being 100 to 150 volts. In order that the true condition of the line may be ascertained.

In measuring the leakage between wires the line under test is opened at the distant end and the voltmeter and battery are connected between the wires as shown in Fig. I. Leakage between wire and ground is measured in the same way except that the wire under test is isolated from its mate and the voltmeter and battery are connected between it and ground as shown in Fig. 2. By the use of a reversing key both positive and negative battery readings are taken and the average of the two readings is used

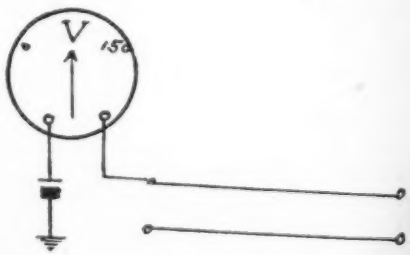

Fig. 2

as it is a fair indication of the leakage condition of the line.

From the voltmeter deflections noted in the above tests and from the known values of the testing battery and voltmeter resistance, the leakage in milli-micromhos per mile is computed as follows:

$$G = \frac{V \times 10^6}{(E - V)\,RL}$$

where

G = leakage in milli-micromhos per mile;

E = voltage of testing battery;

V = deflection of voltmeter;

R = resistance of voltmeter;

L = length in miles of circuit under test;

10^9 = 1,000,000,000.

The writer supervised the clearing up of two toll leads on which the leakage was very excessive. The wires were in contact with valuable pecan trees which could not be cut. Wild vines ran on some of the wire from nearby trees, and in a swampy place the weeds had overgrown poles, wire, and all. In one place fruit trees had been set out along a field fence under the toll lead and these trees had grown up into the wire.

Testing equipment was furnished and I was told to bring the leakage on these lines down to 100 milli-micromhos per mile. We did that, and then some. It was very interesting to note a certain amount of vegetation or other bad condition removed from a line and then put it up on test and see just what effect it had on the condition of the line.

The Ansophone Handles Telephone Calls While You Are Away From Your Office

J. L. Collins, 823 South Mt. Clair street, Dallas, Texas, has perfected and patented a unique and serviceable mechanism designed to aid telephone service which he calls the "Ansophone." The title describes the device, for it is literally a machine for answering a telephone call and to deliver a message to the person calling. Simple and sturdy in construction, with comparatively few parts, it is attached to the lighting circuit of an office or home with connections to the telephone circuit. A ring on that particular phone in the absence of any person to answer, starts the mechanism of the Ansophone, and the machine delivers whatever message that has been dictated to it. For example: The phone rings, the caller, within about four seconds will hear something like this: "This is Doctor Brandwell's office. Doctor Brandwell is making calls and will be here in person at three-thirty. Please call at that time." The next call on that phone will get the same answer, and so on, indefinitely.

To further illustrate: A business man has to leave his office, or the city. He dictates into the Ansophone any message that he wants delivered to telephone callers. The ringing circuit starts a small cylinder to revolving. This connection is made as follows: One wire to a light socket connection and the other wire direct to the line wires. In this manner no connection whatsoever is made to the box, receiver or transmitter. The dictated message is on this cylinder and is directly transmitted to the telephone wire —not through the receiver. The caller receives the message as though it were spoken into the mouthpiece of the phone. When the caller hangs up, the machine instantly reverses itself, and is ready for the next call. The device is designed to fill the want of clerical help in all sorts of business and professional men's offices, assisting office employes or supplanting them. It will enable business men, who are not justified in maintaining a girl constantly on duty at the phone, to leave their offices with the safe assurance that a message in their own voice and words will be delivered to all telephone callers.

The Ansophone has been exhibited at the convention of the United States Telephone Association, which met in Chicago on October 16, 1928, and at the Texas Independent Telephone Association held in March 25 to 28, 1929. At both conventions the machine created something of a sensation, arousing the curiosity and admiration of technical telephone engineers and resulting in numerous orders for future delivery.

A business organization has been formed, composed of Waco, Texas, capitalists, under the name of "The Ansophone Corporation," with offices in Waco, for the manufacture and distribution of the Ansophone.

The Ansophone Answers Your Phone and Reports Any Message You Dictate to Those Who Ring Your Phone.

The Pittsville Telephone Company, Pittsville, Wis., will begin shortly a program of general improvement in its construction of lines and otherwise.

Iowa Holds Interesting Annual Convention

The 34th annual convention of the Iowa Independent Telephone Association was held at Des Moines April 24-25-26. Despite the unfavorable weather and road conditions in the state, a fair attendance was recorded.

Secretary Deering's report showed unusual activities of the association on behalf of the membership for the year. Many farm lines cover Iowa and the power companies are very active in that state, hence there is considerable differences to arbitrate between the electrical utilities in that state. The secretary reported that no adverse legislation was enacted at the session of the legislature just closed. Nineteen district meetings were held during last year.

The president's address covered the usual lines, touching upon the purchase of exchanges by larger organizations, stating that the practice had continued, but with less zeal than formerly. That most of these companies are still in the hands of experienced operators and were members of the association. He stated that indications now were that the buying of these exchanges were good for the industry. He reminded the members that the last legislature had authorized the appointment of a tax commission to revise the tax laws of the state, and that they must be alert to see that their interests were protected. Location of poles on highways is another subject that will be considered by the highway commission this year and operators should watch for rulings by the commission before making any plans for placing poles on highways in Iowa. Other subjects were touched upon by the president of interest to his state.

An interesting program was presented and much interest shown, both in the general session and the operating department.

A banquet and dance furnished the social entertainment for the occasion.

Officers for the coming year are as follows:

President, Earle D. Bellamy of Knoxville; vice-president, J. E. T. Johnson, Gowrie, and secretary-treasurer, Charles C. Deering, Des Moines.

The directors are: George E. Atkinson, Creston; J. M. Mitchell, Tama; J. H. Denkhoff, Dyersville; P. C. Holdoegel, Rockwell City; C. E. Hoy, Albia; F. G. Moore, Newton; W. L. Agee, Marengo; J. E. Lynch, Sac City; H. B. Melick, West Liberty; J. C. Newland, Sutherland; J. M. Plaister, Fort Dodge; C. W. Quillan, Mt. Pleasant, and Phil Zerwas, Manning

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"That is a skyscraper," announced the guide.

Old Lady: "Oh, my! I'd love to see it work."

Ramblings

By J. A. S.

A. D. Shamberg, accountant and salesman extraordinary for Jack Coffey, Indianapolis, has another kind of depreciation to figure on his income for taxation next spring. It's this way: On his road to Columbus recently to attend the Ohio convention in his brand new Blunderbuss Eight, containing his exhibit at the convention and also most of his wearing apparel (for he travels extensively for the Coffey System) he stopped at Springfield for a late evening lunch, leaving his car parked in front of the cafe—unlocked. Ten minutes later he looked for his car (some of the boys say he actually opened the door of the car) and found it was gone; not even the smell of gasoline remained. A salesman in a car parked just behind where Shamberg's Blunderbuss stood invited him (Shamberg) to continue the journey with him. They left Springfield (Ohio) immediately, traveling rapidly. When near Columbus they found the car wrecked on the highway with a crowd around it, but the guilty bird had flown, together with the grips and other belongings. Shamberg now has a new angle on depreciation, as his car was badly wrecked.

* * *

Kenneth Draine, cable expert and at one time connected with the National Cable Compound Company, Mitchell, Ind., died at his home in Indianapolis April 10. He will be remembered as having made many national conventions during the past several years. He leaves a wife and other relatives, besides a host of friends in the telephone industry. Draine was well liked and his friends will regret to learn of his death.

* * *

A trip that will appeal to almost every fellow whether he is in the telephone business or not, is planned by Doc Jones of Athens, Ohio; we'll say its ideal. But we doubt if Doc will take advantage of all the opportunities afforded. He's had his nose to the business grindstone so long that we doubt if he could break away if he wanted to. For more than two decades Jones has been appearing at his place of business around seven o'clock in the forenoon. He is now planning a vacation; can you imagine it! No one ever doubted Jones' ability as a business man! Now, no one can doubt his ability to pick an ideal place for a summer vacation—Alaska, where frigid air is perpetual and the nights (in some parts of the country) are twenty-two hours long. As Amos (of Amos & Andy) would say, "Ain't that something?"

* * *

Over at Rochester, Ind., we stopped in to see Friend Roscoe Pontius, president of the Northern Indiana Telephone Association, and he states that the Wawasee meeting will be held the latter part of June at the same place as last year. We love to attend these meetings; they are different from other meetings. You go to other meetings—and slip out to play golf, attend a show, or what have you?

* * *

While motoring across Ohio we stopped at the factory of the Carbon Products Company, Lancaster, where we had our first lesson in manufacturing telephone batteries. President Hileman took us in charge and showed us "the whole works" from the engine room to the shipping room, where the finished product is placed in cars for final destination. And, believe me, it's some education a fellow gets, too. We are still pondering over the seeming simplicity of the operation and the reason why it "works." On this point we will probably have more to say later on. But the modern machinery used, the clock-like precision of the employes and the continuity of the operation struck us as almost beyond comprehension. The machinery is timed to keep the employe working at top speed at all times; no chance for a fellow to stop and light a cigarette or hardly take a drink of water without interrupting the steady flow of material passing his bench. As an employer of union help in the past, we could not help wonder what the average union man would say if confronted with such a job. He would probably conclude he had found hades here on earth.

* * *

As intimated in the above, we expect to have something further to say about this factory in a future issue; just as soon as our Ford mind is trained to harmonize with our Cadillac idea. But from this trip through the factory of the Carbon Products Company we are firmly convinced that the batteries produced by this concern are just as strong as our faith in that sturdy vice-president who percolates from the Chicago office, Frank Eldridge—100 per cent.

* * *

Rolland S. Jones, son of Dr. C. L. Jones of Athens, Ohio, recently took unto himself a wife, and they attended the Ohio convention last month. Rolland was recently made assistant manager of the Athens Home Telephone Company, and will have charge of that exchange while his dad cavorts around over the country, seeing Canada and Alaska. "Some men are born great, some achieve greatness and others have greatness thrust upon them." It seems to us that Rolland was born under a lucky star—every word of the above quotation applies to him. We congratulate Rolland and his bride.

* * *

Unlike the fast eastern time we ran into at Dayton, Ohio, L. M. Berry takes his own good time to get down to work, usually reaching his office in the forenoon, we are told. But once you meet this gallant gentleman you forget all about the time you have been waiting for him. He enjoys life and exuberates it and you just naturally inhale his enthusiasm and enjoy living when with him. Berry has plenty of time for his friends, but he has one of the best organizations in the country to carry on his telephone directory work, and they are born diplomats too.

* * *

And while talking about the combination of good fellows and good business men, our mind just naturally wanders back to Texarkana where we renewed our acquaintance with A. C. Stuart, general manager of a string of exchanges in the Lone Star state, who always has time to meet friends, talk fishing, hunting or business; and when it comes to business Stuart certainly knows his onions. Talking about Texas and fishing, Red River is just outside of Texarkana, and used to supply fish for the hungry Texans living on the northern border of the state. In our boyhood we used to fish in this vicinity, but could never catch anything larger than a half pound perch or cat. Nets, dynamite and seining were outlawed, and Texas people never violate a law. So we were told that the larger fish were so plentiful that they swim along the edge and attack those who get close to the water's edge, just as alligators attack negroes in the South. We're not vouching for the story, but fish could be purchased for almost nothing along the Red River. Stuart is a "big" fish in a business way, but is not easily caught, but a true friend once you win his confidence.

* * *

And then there was the Chicagoan attending the Texas convention who could not understand the attitude of the southern farmer in placing his "telephone booth" in the back yard, when there was so much open space along the highway.

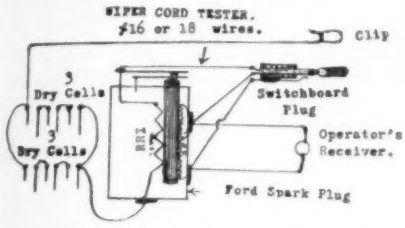
* * *

This office was favored April 11 by a visit from an old subscriber from half around the world, Ettore Fiocchi, Piazza Castello 3, Milano (109) Italy. This gentleman was in the states on business and called in person to pay his subscription in cash. And we were greatly relieved when he produced pure old United States coin of the realm. Of course we'd like to have a few bushels next trip across the continent, but a dime at Thompson's will get you further than a lira or a liar any time. But we are always pleased at the opportunity of having those of the industry from foreign lands visit our humble domicile.

LINE AND DESK

WE ASK YOUR PARDON

In the rush of make-up time, we omitted the drawing to accompany the excellent suggestion of Mr. A. M. Brill for a wiper cord tester. The interest which Mr. Brill's article aroused is evi-



denced by several letters which we have received calling our attention to the omission. We herewith make our apologies for the oversight and present the drawing which we are sure will prove helpful to our many readers who have the job of maintaining automatic telephone equipment.

THE HUMAN ELEMENT IN ACCIDENT PREVENTION

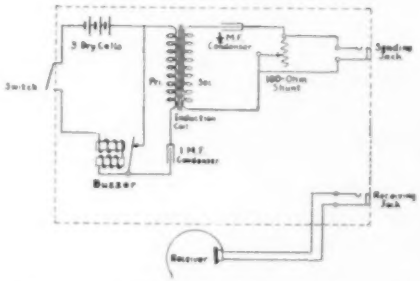
Someone has described the foot as that part of the human body that is always under a falling object. No doubt he spoke from painful experience. However, the statement serves to remind us of a general misconception regarding the causes of accidents. Practically every list of accident causes we have seen included the item "falling objects" as one of the direct or primary causes. This is strictly a superficial or surface view of the matter, however, because the accident might with as much reason be attributed to the contact of the falling object with the human body—the blow at the end of the fall—which does the damage. As a matter of fact, the falling body is not the cause but rather the active agent. The real cause lies further back.

If a workman leaves a wrench or other heavy object on an elevated walkway, and later on the object is knocked off by a passing workman, or is jarred to the edge of the walkway by vibration and then falls, injuring another workman below, can we logically say that the cause of the accident was a "falling object?" Even though we do illogically give and accept this as a cause, do we learn anything that will assist in preventing a recurrence. The real cause is lack of foresight and dereliction of the human element. Human failure on the part of the builder or designer is not providing toe-boards on the elevated walkway; human failure on the part of the foreman in neglecting to train workmen to avoid leaving tools in exposed places; human failure on the part of the higher executives in not exacting strict compliance with safety rules and practices; and probably greatest of all, human failure in not knowing much about this accident prevention business.—The Travelers Standard.

HE DOESN'T TRUST THE OLD ANCHORS

One of the things which tempts me to use Biblical language (with reverse English) happens when a supervisor tells me to take a chance that an old anchor will hold when I am working over a pole line. It is not exactly a grand and glorious feeling when you get the guys on and the slack nicely evened on a four arm lead, then to have an old anchor give somewhere and you are back to the same place you started. Some of the boys say, "What difference does it make? He told you to leave it." But I floated around quite a lot in my younger days and I never did like to work too long in the same place. If they don't watch me too close, I am for slipping in the new anchors along with the rest of the work, especially if I haven't been able to get the family history of the old anchors that are on the job.—Contributed by Bob Ewbank.

An A-C Tone Tester



The above alternating current tone tester is being successfully used to detect a large number of faults which cause poor transmission. The test set can be easily and cheaply constructed. By means of its use troubles such as cord circuits, noisy cords, undersized plugs, dirty plugs, poorly adjusted and dirty key and relay contacts, where such affect the transmission feature of a circuit, are readily located in exchange and B. P. X. switchboards. Designed by T. De Witt Talmage, telephone transmission engineer, Springfield, Ill.

WHAT DO THE SAFETY RULES SAY IN A CASE LIKE THIS?

Nebraska Division Construction Foreman E. J. McKinley passed this story on to us:

Two of Foreman William Potter's men were placing new crossarms on a new pole. The arms were ready to be "lagged" and the lineman on the pole called down to the new groundman:

"Give me a look on the arm, will you?"

New groundman: "Do you want it on the handline?"

—Northwestern Bell.

CENTRALIZED BATTERIES FOR OFFICE BUILDINGS

The extended use of small gauge wire in plant introduces operating problems involving transmission, signalling and the supply of power to private branch exchange switchboards. The latter problem, which is discussed here, has found an economic solution in the use of local batteries as the switchboard charged over cable pairs from the central office battery.

In effecting the recent cut-over of Randolph Office to operate from a building some 2,500 cable feet distant from the old location, twenty-six-gauge cable was used in splicing the subscribers' cable plant into the new office. Because of the added cable resistance thus introduced and the heavy non-multiple private branch exchange fill in this area, it developed that greater economy would be realized by the installation of a common battery for all switchboards within an office building than if this supply were furnished direct over cable pairs or from a local battery individual to each board. A centralized battery plant was accordingly developed in sizes of eighteen, thirty-six and seventy-two ampere hour capacities arranged for charging over cable pairs from central office forty-eight-volt batteries.

As will be seen from the accompanying photographs, the centralized unit as developed consists of a ten-cell battery mounted in a suitable wood cabinet with protective fuses, charging resistances, and charge control rheostat mounted in

a separate metal cabinet directly above the battery cabinet. The complete unit is arranged for mounting in a building basement in the vicinity of the underground cable box to which it may readily be cabled for cross connection to underground and building cable pairs.

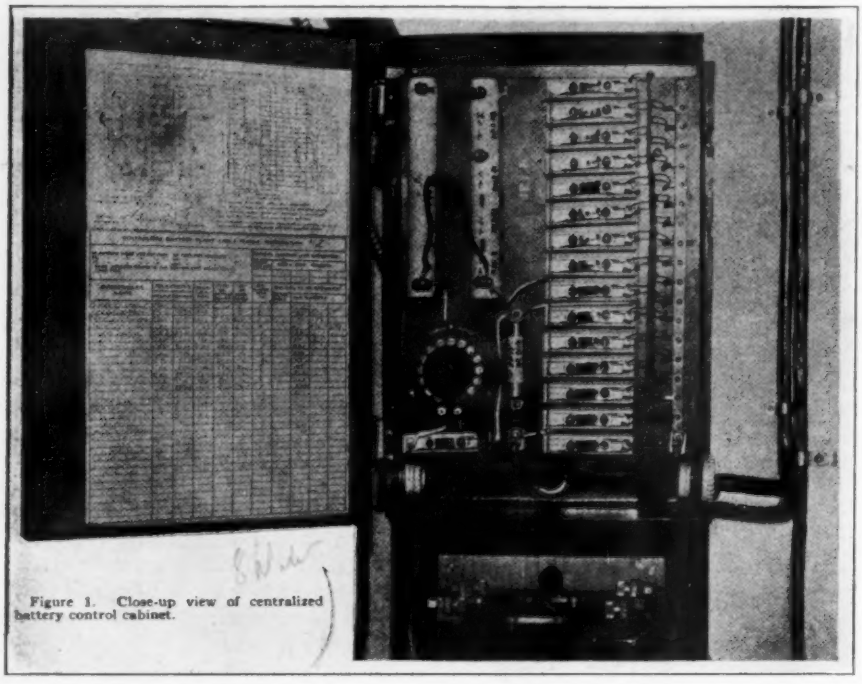


Figure 1. Close-up view of centralized battery control cabinet.

Figue 1 is a close-up view of the central cabinet showing the entrance of the lead covered tie cable from the underground cable box. This view also shows in some detail the layout of the local wiring form with respect to the associated apparatus. It will be noted that the cabinet is of metal construction as a protection against a possible fire hazard. Fifteen discharge fuses and one charge fuse are conveniently arranged and accessible for maintenance, each discharge fuse accommodating a cord switchboard of the 500 or 551 type or not more than three cordless switchboards of the 505 type.

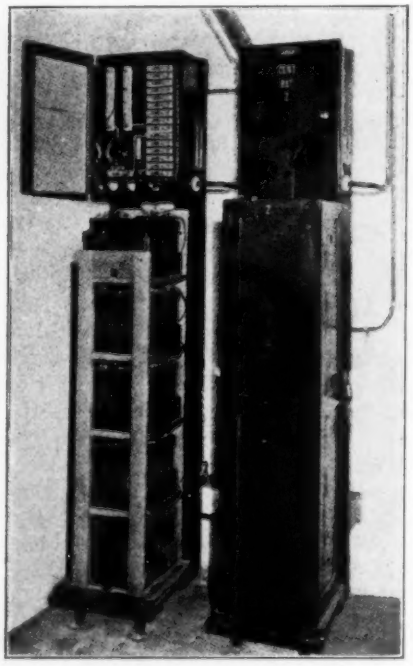


Figure 2. This is a typical installation showing two centralized battery units as a source of power supply for switchboards in the average office building.

Inside of the cabinet cover will be seen the circuit label and also a record of the switchboards which are connected to the associated discharge fuses, the battery charging pairs and the local building cable pairs from the battery to the switchboard which carries the power supply to the board. Indicating fuses on an alarm type mounting are used in both the charge and discharge circuits, and the alarm lead is terminated at the central office in an alarm cabinet near the local test desk. By this means, a repairman may be promptly dispatched to the address at which the battery is located for the replacement of such fuses as may be blown.

This method of battery supply to private branch exchange switchboards in metropolitan areas, it appears, will result in considerable economy and probably will offer some improvement in noise conditions on private branch exchange circuits. Further, it may also be used to advantage where existing battery feeder pairs may be released for service and cable plant additions thereby deferred, and also where sufficient cable pairs are not available to furnish a supply of current to the switchboard on a direct cable pair basis.—*W. V. Kahler in Bell Telephone News.*

THEY WOULD HAVE TO BE "SOME JUMPERS" AT THAT

An employe of the General Plant Accounting office at Washington sends this thought, reports the Transmitter:

Scientists are working to create a telephone pole that will withstand the impact of a car going 45 miles an hour.

It would be much better to have poles that could jump out of the way.

Begin Phone Subway to Connect Cities

One link in the vast chain of 2,500 miles of long distance subways to connect the principal cities of the Southwest is to be started between Joplin, Webb City, Carterville and Carthage at once, George A. Smith, district manager of the Southwestern Bell Telephone Company, announced recently.

The 18 miles of long distance cables between Joplin and Carthage will be placed at a cost of nearly $300,000 to insure the highest type of long distance service for this vicinity and to provide for the increased use of telephones both locally and to distant cities.

The "Subway" between Joplin and Carterville is to be the first step in the program in Missouri. The trench for the cables is to be dug between Carterville and Carthage as soon as the Joplin end of the project has been completed. After the trench has been completed and the conduit placed, the new cables will be pulled through. The work is scheduled to be completed about Jan. 1, 1930.

Approximately 300 pairs of wire, as many as ten heavy pole lines can carry, will be contained in the cable. An increase of about 30 per cent or 150 conversations per day is estimated in the next five years. The new cable is expected to provide for growth for twenty years. An average of about 500 calls per day now come over the lines between Carthage and Joplin.

C. M. Sporey Chicago Manager MacGillis & Gibbs Co.

Charles M. Sporey of Milwaukee, has been appointed sales representative in charge of the Chicago office of the MacGillis & Gibbs company, with headquarters at 80 East Jackson boulevard, 613 Railway Exchange building. Mr. Sporey succeeds B. J. Libbe, who recently resigned.

Mr. Sporey has been in the research department of this concern for some time and has had a great deal of practical experience in the operation of cedar pole yards, and especially wood preservation and timber studies. He will be glad to give you the benefit of this experience and serve your wants.

Planning high-speed business

An Advertisement of the
American Telephone and Telegraph Company

More than 95% of the telephone calls from one town to another in the Bell System are now on a high-speed basis. This holds whether the call is from New Orleans to Boston or from New York to Oyster Bay.

Even if it is a long call, the operator in many cases now asks you to hold the telephone while the call is put through.

Calls from one town to another used to be handled by one operator taking your order and giving it to another group of operators to put through. You now give your call direct to the operators who put it through—and put it through fast while you are on the line. The average time for handling all toll and long distance calls in the Bell System was further materially reduced in 1928.

A high-speed service to all parts of the country—calls from one town to another as swift, clear and easy as local calls—that is the aim of the Bell System.

This is one of the many improvements in methods and appliances which are constantly being introduced to give high-speed telephone service.

Better and better telephone service at the lowest cost is ever the goal of the Bell System.

"The Telephone Books are the Directory of the Nation"

Submerged Cable Leakage

Some Facts Which Must Be Known in Order to Successfully Locate Trouble in Cable Buried in the Ground

By CHRIS D. STEWART

Some time ago the writer promised the readers of TELEPHONE ENGINEER, an article covering the method of location of trouble in cables buried in the ground and not protected by conduit.

Since making this announcement, Stewart Brothers, have received a number of letters asking when the article would appear, and in view of this fact as well as that now is the time for these troubles to show up, it was thought now would be an opportune time for the article.

It would at first seem quite a big job to locate this trouble, but the hardest part of it seems to be getting started. There are two methods, the bridge method and the inductive fault finder.

While at first thought it would seem that the bridge method would be the most practical, certain conditions which are usually met, cause this not to be a fact.

Probably for this reason, the inductive fault finder method is the most popular among the field-men.

When the sheath of a cable underground gets a hole in it, moisture continues to enter the cable until it has been located and repaired. This is due to the fact that the core of a cable is absolutely dry and the insulation is paper, and this paper wicks in the moisture at an alarming rate.

From this it can readily be seen that it is highly advisable to be equipped to go after this trouble as soon as it shows up. Usually before the trouble can be located, the moisture has entered the cable from 10 to 75 feet each way from the hole in the sheath.

Therefore, the sooner the trouble can be located, the more cable can be saved.

While most telephone men are familiar with the inductive fault-finder, for the benefit of those who are not, a brief description of its operation will be given.

It consists of sending an intermittent current out over the faulty conductor to the fault and return either by another conductor or the sheath. Then by placing an exploring coil attached to a receiver to the cable, a tone can be heard in the receiver, provided the exploring coil is placed to the cable at any point between the sender and the fault.

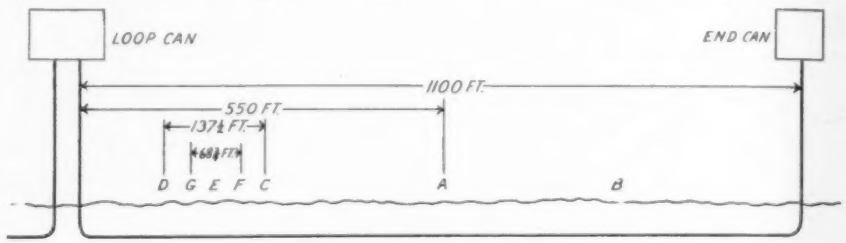
The necessary proceedure in locating a case of this undeground trouble can no doubt be readily understood by describing the location of an actual case of trouble giving the time, etc.

The writer was called on long distance at 8:45 a. m. by a small company operating about 700 telephones, who had some buried cable that had gone bad.

The trouble was between the last loop can and the end of the cable a distance of approximately 1100 feet.

A "Stewart" cable tester was sent by auto and the man was advised to have holes dug down to the cable at A, B and C. Note sketch.

The cable tester arrived at 10:30 a. m. and was connected to a wire, which had



a heavy leak on it, at the loop can, going toward the end, and the line was taken off at the end of the cable.

The exploring coil was applied to the cable at A and no tone was heard. Then again at C and no tone was heard.

Another hole was dug at D and the tone could be heard here. Also at E, and it was found that gophers had gnawed a hole in the sheath at E.

Another hole was dug at F and the tone could not be heard here. This showed all the trouble to be between the loop can and F.

The next step was to find out how

The Stewart Cable Tester

much cable was damaged between F and the loop can.

To do this, the cable tester was taken to the end of the cable and connected to the same grounded conductor and the pair left in the clear at the loop can.

With the sender at the end of the cable the tone could not be heard at D. It was now known that all the trouble was between D and F and there was one hole in the sheath at E. Then a hole was dug at G, and a test made, and the tone could not be heard. It was now known that the trouble was between F and G and there was a hole in the sheath at E.

It was now 12:00 o'clock noon and all these tests had been made since 10:30 a. m. However, two of the holes used in this test had been dug prior to the time the instrument arrived.

The hole at B was wasted effort, but inasmuch as the digger had time to dig this hole before the instrument arrived, if the trouble had been in the other section of the cable it would save time.

It was known at the time that A and B were dug that one of them would be wasted effort, but even so it was a gain of time. Had the instrument been on hand, this step would have been eliminated.

As the diggers went each way E another hole was found about 4 feet toward the end and four more holes were found toward the loop can, the farthest about 20 feet from E.

When the digger arrived at G and E and no more holes were found, it was decided to replace the cable from G to F.

The cable was opened and all the trouble showed in the piece where it tested to be.

When the first hole was found at E and it was identified as the work of golfers, of course the thing to do then was to dig each way and examine the cable as they went. However, it was known at this time that the trouble was between C and D and by making two more tests it was found to be between G and F.

The writer believes that good time was made in making this location. The digging was good and the digger was a fast worker, and while the trouble cannot always be located as quickly as this one, yet it can readily be seen that it is not as big a job as it looks to be.

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When High Maintenance Costs threaten your operating efficiency and profits, call out the Militia—the Kester Corps of Flux-core Solders.

KESTER Flux-core Solders are the standard for telephone work—ROSIN-CORE for inside and ACID-CORE for outside work—a full line of sizes in spools of various weights.

KESTER is made with the flux itself right in the core of the solder, saving time and losses. KESTER Solder is your protection against increasing resistance due to corrosion and the resulting high maintenance costs.
Our research and experimental department is at your service to aid you in your soldering problems.

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FLUX-CORE

Get EVER-PROTECT aid in your construction.

EVER-PROTECT has proved practical and profitable in making many hundreds of cable installations underground without a conduit. It protects cable against storm damage, corrosion, chemical action, electrolysis and abrasion.
In liquid form EVER-PROTECT is great for overhead work, protecting your cable and messengers against chemical action and other destructive influences.
Ask your nearest jobber for complete details.

EVER-PROTECT CABLE COMPOUND
TRADE MARK REG. U.S. PAT. OFF.

National Cable Compound Co.
Incorporated
MITCHELL - - IND.

Exide
BATTERIES

have faithfully served the Telephone Industry for the past 35 years.

This significant fact assures the same dependability for the future.

THE ELECTRIC STORAGE BATTERY CO.
PHILADELPHIA
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Prest-O-Lite Process is *extremely* simple

NO delicate, complicated, or moving parts to require expensive repairs or replacement . . . No adjustments . . . Lasts indefinitely with ordinary care.

Utility Companies everywhere find that Prest-O-Lite blow-torches—using Prest-O-Lite Gas—are handier than any other equipment for soldering, sweating, splicing, wiping, brazing and similar heating jobs. Prest-O-Lite Process speeds up the work and saves money.

Phone the Prest-O-Lite Gas Distributor about this equipment or write us direct for complete information.

Prest-O-Lite Gas is available everywhere. Any one of 15,000 Prest-O-Lite Exchange Stations can supply you quickly with a full tank.

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Prest-O-Lite GAS

The writer was told by a telephone manager while at the Minnesota convention that he had a good measuring instrument but seldom used it, as he could dig down to the cable quicker than he could string out a clear wire to form a loop.

When the cable is buried with no protection at all, the digger should have a chisel shaped stick and when he gets down to about eight inches from the bottom of the trench, the cable can be found with the stick and lessen the danger of digging into it with a shovel. The digger that dug the test holes in this case scooped the dirt out with his hands when he got near the cable.

The trench can usually be easily followed because the earth has been disturbed. Also this makes the digging easier.

It was also found that it was absolutely necessary to use the fish tail coil, as otherwise the current on the sheath would carry the tone by the fault.

This is probably due to the condenser action between the wires ahead of the fault and the sheath, and as the sheath is one side of the condenser, it is necessary to have a coil that is neutral to the tone on the sheath.

It can readily be understood that when a hole occurs in the sheath of the cable where the cable is buried in the ground, that practically always, all the pairs are wet, and in order to locate this trouble with a measuring instrument it is necessary to string out a clear wire over the top of the ground to form a loop.

Of course it is not necessary to hold the coil on the bottom of the cable as is done in aerial cables. In cable buried in the ground the coil can be held on the top of the cable which would be the easiest place, but held firmly to the sheath to prevent off balance.

The reason the coil is held to the bottom of the cable in aerial cables is to neutralize the tone on the messenger.

Also, without the resistance in the cable tester, the tone could be heard beyond the fault due to the capacity of the wire ahead of the fault.

The experience detailed above shows without a doubt that a cable tester for practical location of this trouble must have a coil neutral to the tone on the sheath, and a resistance that can be cut in series with the sender.

Also, that it is very advisable to have a cable tester on hand so that the trouble can be located as quickly as possible to keep the moisture from wicking too far into the cable.

Some time in the near future the writer will give details of another case of trouble in buried cable where the conditions were different and yet the trouble was located in a very short time and repaired in the most economical way.

From the above tests it will be noted that the cable tester not only locates the hole in the sheath but determines how far the moisture has wicked each way from the hole in the sheath.

Anyone desiring further information regarding the cable tester with which the above tests were made may write Stewart Brothers at Ottawa, Ill., for further information.

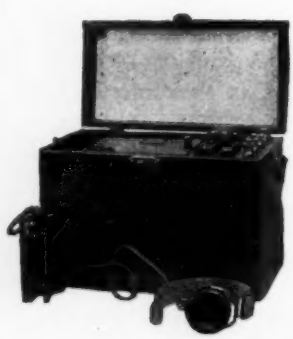
Pennsylvania Convention Meets May 28th and 29th

The Pennsylvanians always hold good conventions, and "Brad" says this year will be no exception; in fact, he expects a "better than usual" meeting this year. The dates have been set—May 28 and 29—and of course it will be at the Penn-Harris hotel. Sure, you should be there.

Vermont Convention at Burlington June 25 and 26

The ninth annual convention of the Vermont Telephone Association has been announced for Tuesday and Wednesday, June 25 and 26, at Hotel Van Ness Burlington, Vt.

CABLE TROUBLE
IS SURE TO COME



Be prepared to clear the trouble promptly. Have a "STEWART" Cable Tester on hand and realize that you have at hand the best known means of locating this trouble.

Cable trouble must be cleared, and, if done quickly, it is a saving for the cable, as well as the service.

Do not take a chance. The "STEWART" is a sure shot.

The patented Exploring Coil, furnished with the "STEWART," is the only coil that is practical for locating wet spots. This has actually been proved by tests.

A Cable Tester, designed and manufactured by experts, whose only business is the making of testing apparatus, is better than one made by a large company as a side issue.

The "STEWART" Cable Tester is by far the best Cable Tester that money can buy, and yet it is priced from $8.00 to $20.00 under other Cable Testers.

Price $57.00 f. o. b. Ottawa, Ill.

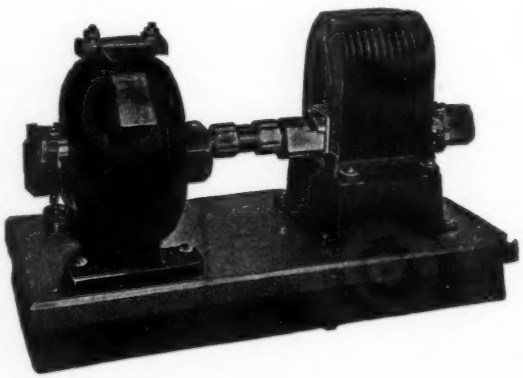
Sent on trial.

Write for bulletin.

Detecto-Meters—Direct Reading Test Cabinets and Linemen's Test Set, with exploring coil.

STEWART BROS., Ottawa, Ill.

HOLTZER-CABOT
Magneto - Ringing - Motor - Generators
Maintain Better Service



Maintaining an efficient, economical, carefree ringing service need not be a problem—but it does require good judgment in selecting your equipment.

Install Holtzer-Cabot Magneto Ringing Motor Generators. These units will enable you to dispense with battery maintenance and constant service diligence. Can be supplied for any voltage or special current.

We invite correspondence. Complete data on request.

HOLTZER-CABOT ELECTRIC CO.

125 Amory Street, Boston, Mass.

6161 So. State Street, Chicago, Ill.

Telephone Books You Should Have

Makes no difference whether you are Manager, Lineman, Trouble Shooter, Engineer, Operator or Office Boy, you need some of these Books. Look the list over and send us your order.

AUTOMATIC TELEPHONE SYSTEMS. By William Aitken. Covers the whole field of automatic telephony
Vol. I, 297 pages.....$10.00
Contents: Definitions; First Principles; Dial Impulse Senders; Dial Adjustments; Dials, Special Features; Dial Interchangeable Crown Wheel; Telephone Instruments; Strowger System of Automatic Telephone Manufacturing Co.
Vol. II, 230 pages.....$10.00
Contents: Equipment in Subscribers' Offices; Party Line Working $12.50

AUTOMATIC TELEPHONY. By Arthur Bessey Smith and Wilson Lee Campbell. New edition. 430 pages, 315 diagrams and illustrations.....$ 5.00

AUTOMATIC TELEPHONES. By F. A. Ellson...$ 1.50

AN OUTLINE OF AUTOMATIC TELEPHONE. By Wm. Aitken.....$ 1.75

DRAKE'S TELEPHONE HANDBOOK. By Prof. D. P. Moreton. 286 pages; 161 illustrations; pocket size, cloth, red edges.....$ 1.50

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ELECTRICAL ENGINEERS' POCKETBOOK. By Horatio A. Foster. 1636 pages; 718 tables; 1128 illustrations .....$ 5.00

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Chapter headings: I—Wire and Radio Telephone Systems. II—High Frequency Currents and Their Production. III—Vacuum Tubes. IV—Vacuum Tube Oscillators. V—Modulator Systems. VI—Receiving Equipment. VII—Transmission. VIII—Miscellaneous. IX—Super-regenerative System.

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HAWKINS ELECTRICAL GUIDES—10 volumes; 3,500 pages, 4,700 pictures; pocket size, flexible black covers. Price, payable $1.00 per month, if so desired. Per volume.....$ 1.00
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279 pages, 66 diagrams, 8 folding inserts.

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572 pages, with 684 illustrations. A textbook for students of Telephony and a useful Handbook for Operators. Seventh Edition, thoroughly revised and enlarged.

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Principal subjects (Fundamental Principles): History and development—Acoustics—Electrical reproduction of speech—Electrical signals—telephone lines. (Substation Equipment). Transmitters — Receivers — Primary cells — Magneto signaling apparatus—The hook switch—Electromagnets and inductive coils—Non-inductive resistance devices — Condensers — Current supply to transmitters— etc.

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Contents: Telephone Principles—Local Battery Receiver, Transmitter and Induction Coil—Batteries and Battery Tests—The Magneto and Magneto Signalling; Ringer, Hookswitch and Receiver Cord—The Private Line—Bridging Party Lines—Exchanges and Switchboards—Magneto Switchboard—Combined Drops and Jacks; Ringers and Jacks—Power Ringing—Cord Circuit Apparatus—Repeating Coils—Party Lines, Selective Ringing—Common Battery Switchboards; Simple, Two-Wire and Transfer Types—Common Battery Subscriber's Line—Multiple Switchboard Operation—Feature Boards . . . Automatic Switching; Hundred Line Exchange; Connector Switch, line-switches, Finder Switch—The Automatic Instrument—Series Circuits; Booster Circuits with Polar and Non-polar Receivers—Thousand Line Exchange; Selector Switch, Trunk Slip —(P. B. X.); Measured Service and Pay Stations.

TELEPHONE INSTRUMENTS, THEIR OPERATION, ARRANGEMENT AND MANAGEMENT. By W. H. Radcliffe.....$ 2.00
The purpose of this book is to give a thoroughly practical and complete course of instruction in the operation, installation and maintenance of telephone instruments in so far as they relate to private lines and telephone exchanges. Handsomely bound in cloth and printed in large type on good paper. Contains one hundred and thirty-four pages, with sixty illustrations.

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ENCLOSE CHECK AND SEND YOUR ORDER TO

TELEPHONE ENGINEER

CHICAGO, ILLINOIS

New Sales Manager for W. N. Matthews Corporation

W. N. Matthews Corporation, St. Louis, announce, effective May 1st, Mr. Thomas C. Clark, formerly district manager of their St. Louis territory, comprising the states of Missouri, Kansas, Oklahoma and Arkansas, Western Kentucky and Southern Illinois, has been made sales manager of the company.

Before coming with the W. N. Matthews Corporation Mr. Clark was graduated from the University of Missouri as an electrical engineer, and entered the employ of the Union Light & Power Company, with which company he spent fifteen years. When he left them to join the W. N. Matthews Corporation he was superintendent of their central division.

The western Kentucky part of Mr. Clark's territory has been turned over to Mr. John L. Reighart, 88 Kenyon building, Louisville, Ky.

W. N. Matthews Corporation wishes also to announce that, effective May 8th, E. S. Stickle Company, 934 Union Trust building, Pittsburgh, Pennsylvania, will take over all the state of Ohio formerly covered by Mr. B. F. Perry and Mr. John L. Reighart. This is in addition to Western Pennsylvania and West Virginia, in which states they now represent W. N. Matthews Corporation.

Illinois District Meeting

The next district meeting of the Illinois Telephone Association will be held at Mattoon, Illinois, Thursday, May 23rd.

There will be two separate schools of instruction, one for the traffic people, and the other for the plant people. The host company is the Illinois Southeastern Telephone Company, Mattoon, Illinois.

Four Wheel Drive Auto Company Acquires Menominee Motor Truck Company

A majority of the stock of the Menominee Motor Truck Company of Wisconsin has recently been acquired by the Four Wheel Drive Auto Company. The Menominee plant lies just across the railroad tracks from the FWD plant. The subsidiary will be known as the Utility Supply Company, and will manufacture derricks, winches, power take-offs, trailers and earth boring machines.

Until the present time this equipment has been manufactured in the FWD plant. Increased business, however, necessitated acquiring additional factory space and it was decided that the Menominee plant was admirably suited for the purpose. New machinery is already being installed and the plant is being put in first class condition to manufacture equipment for the utility field. The new company will be amply financed to take care of all its requirements.

Menominee trucks will continue to be manufactured by the Utility Supply Company and will also be serviced by them.

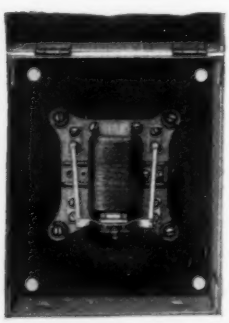
Phone Company Holds Open House

A total of 285 persons attended the open house held by The Home Telephone and Telegraph Company of Fort Wayne, Ind., in their new full automatic office at New Haven, Saturday afternoon and evening, April 20.

The office, which occupies the top floor of the New Haven State Bank building, was decorated with flowers and palms. Demonstrating equipment was set up for the occasion.

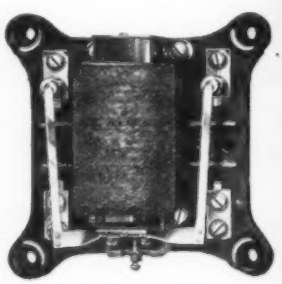
Those who attended showed keen interest in the new central office equipment and expressed a great deal of pleasure with the service they have received since its installation.

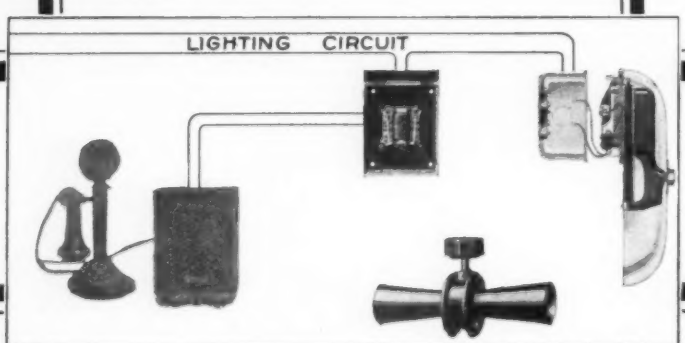
The New Haven office was cut over to full automatic on November 15 at midnight. Since that time the exchange quarters have been completely redecorated and rearranged. The New Haven exchange serves approximately 600 subscribers.



Signal Engineering
Loud Ringing Telephone Sets

Relay operates on standard ringing current, picking up local current to ring loud *Signal Engineering* Bell or Horn.



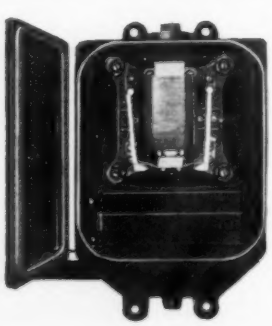


ABOVE: Relay with non-weatherproof housing.

BELOW: Relay with condenser in weatherproof housing.

ABOVE: Relay withou housing.

BELOW: Relay with condenser in non-weatherproof housing.



Relay supplied for AC or DC with either 1000 or 1700 OHM Coil with or without condenser. Approved by Underwriters' Laboratories, Inc.

Samples for test to Telephone Companies.

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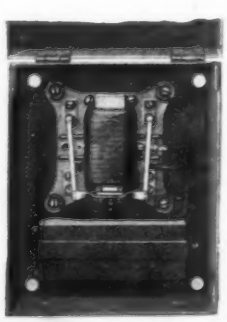


THE Monotype Series of standardized switchboards cover the entire field of requirements of manual switching equipment. These units, from the smallest P. B. X. to the largest central energy multiple board, combine the outstanding improvements of telephone engineering history with many new features that are the exclusive work of the American Electric research staff. Their longer life — their lower maintenance cost — their better service and their more economical operation are benefits directly derived from the policy of progressive engineering founded on the bed-rock of operating experience.

Whatever your manual switchboard requirements may be, there is a particular model of Monotype board to meet them. Ask American Electric engineers to submit complete information and specifications.

The Monotype Series

MONOTYPE SENIOR
Unit position central battery multiple

MONOTYPE SENIOR M
Unit position magneto multiple

MONOTYPE JUNIOR
600 line central battery multiple

MONOTYPE CONVERTIBLE
400 line magneto convertible to C. B.

MONOTYPE 150-M
150 line magneto

MONOTYPE 30-M
30 line magneto

MONOTYPE P. B. X.
50 or 100 line P. B. X's.

MONOTYPE CORDLESS
Cordless P. B. X.

American Electric Company, Inc.
STATE AT SIXTY-FOURTH STREET
CHICAGO, U.S.A.

Ottawa Phone Plant Bought by Utilities Co.

The Utilities Service Company, with headquarters at Alliance, owners of the Lima Telephone & Telegraph Company, has acquired the controlling interest in the plant and equipment of the Ottawa Farmers Mutual Telephone Company, at Ottawa. The Ottawa concern, which has about 250 subscribers, will continue to operate under the old title. The consideration involved in the deal was not divulged.

Tentative plans have been formulated for the expenditure of approximately $25,000 this summer to thoroughly modernize the plant and lines at Ottawa, it was said by O. J. Neuman, general manager of the Lima Telephone & Telegraph Company. The plant and lines at Ottawa will be fully rebuilt, Neuman said.

Plan International Phone Chain

Powerful Swedish financial interests, headed by Ivar Kreuger, president of Kreuger & Toll, are planning an international telephone chain patterned after the International Telephone & Telegraph Corp. of New York, according to reports. The Swedish interests have had close dealings with foreign governments through match monopolies.

103 Miles of Underground Telephone Cable to Cost $1,600,000

The Southwestern Bell Telephone Company, St. Louis, plans to begin construction March 20 of an underground cable between Fort Worth and Cisco, Texas, the line to go by way of Santo. The project presents a number of interesting features, it is said, as it will be among the first long distance telephone cables to be laid under ground, while the cable itself will be different from any now in service in that it eliminates the use of conduits, a new type of metal sheath being used which makes the conduit unnecessary. The line will be 103 miles long and will require 850 reels of cable, each weighing 5 tons. The cost of the project is estimated at $1,600,000.

Plans Long-Distance Sea Telephone Line

A deep-sea long distance telephone cable that can be utilized for trans-Atlantic traffic has just been perfected in the laboratories of the Bell Telephone Company, as an outgrowth of the discovery of permalloy, Walter S. Gifford, President of the Company, announced yesterday. He added that construction of such a cable is now being considered.

Not only will the utilization of cables for trans-Atlantic telephony mean an added capacity for overseas service, Mr. Gifford pointed out, but it will insure greater reliability than is possible by the best known radio methods, for in spite of the use of both long and short waves, the inherent deficiencies of radio interferes at times with the service.

Moreover, these new cables, when not being used for telephone conversations, will permit of telegraph operation at a higher speed than the most modern high-speed permalloy telegraph cables which have been in use heretofore.

Permalloy was discovered in the Bell Telephone laboratories a few years ago and since then several high-speed permalloy cables have been constructed and laid. While submarine cables have been used successfully for years over short distances, as from Key West to Cuba or across the English Channel, it has been impossible up to now to build trans-Atlantic cables because current sufficient to carry speech could not be sent such long distances without fading. Then, too, devices needed on land for amplifying, such as loading coils and repeaters, could not be attached to the wire in the core of the cable under water.

In announcing that the new deep-sea cable had been perfected Mr. Gifford said: "While the American Telephone and Telegraph Company was a pioneer in radio-telephone development, its desire to furnish the best and most dependable telephone service to Europe has led the company to carry on for many years extensive research in deep-sea long distance telephone cables."

All America Cables in Nicaragua

A concession to operate wireless telephone, telegraph and television between San Juan del Sur and Managua, Nicaragua, with the right to extend the service internationally, has been granted All America Cables, Inc., it was announced April 18. The concession was approved and signed by President Moncado, of Nicaragua. All America Cables, Inc., was represented in the negotiations by Melville L. Cordue.

Equipment has already been ordered and two stations are expected to be in operation in about 90 days. One of the All America Company's cables terminates at San Juan del Sur, Nicaragua. The wireless concession is to continue 20 years, at the expiration of which the government of Nicaragua has the option to purchase the stations or to permit the company to continue operation under general laws and regulations.

Rochester, New York, Has Installed Its 100,000th Phone

The Rochester Telephone Corporation, Rochester, New York, has recently installed its 100,000th telephone, the ideal for which it has been striving for some time. Its growth the past seven years has been phenomenal—almost doubling in that time.

Transatlantic Telephone Facilities Inadequate

While transatlantic telephony has been a commercial possibility only two years, the volume of business has already at times overloaded the radio-telephone facilities, according to the Electrical World. A short-wave channel is now in use supplementing the long-wave channel. Increasing use and further development of transatlantic telephony will require further facilities. During the past year the research engineers of the Bell Telephone Laboratories perfected a means of making a transatlantic telephone cable. This cable, when constructed and laid, will not only substantially increase the facilities for transatlantic communication but will also provide a circuit of maximum reliability. In the meantime, radio-telephone transmission is being further developed and more transatlantic radio channels are planned.

Invents Telephone Cable

Cologne.—Telephoning by submarine cable between Europe and America is possible by a new kind of cable, D. P. Georg Zapf, scientist for a Cologne engineering company, declared recently. Dr. Zapf has constructed a section of special flexible cable, in which strands of telephone wires are embedded, capable of resisting a pressure of 600 atmospheres.

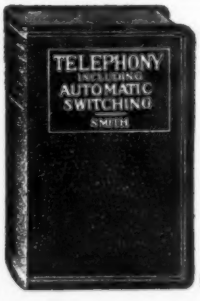
Experts here believe undersea telephone conversation by Dr. Zapf's cable is technically feasible.

"Rastus, I understand that you have become the father of twins. Have you named them yet?"

"Yessuh, Ah done call the fust one Adagio Allegro, and Ah'm go'n t' call the second one Encore."

"Musical name, all right. But why do you call the second one Encore?"

"Well, suh, you see, he wasn't on the program at all."



A Great Practical Book *for the* Practical Telephone Man

TELEPHONY
including
AUTOMATIC SWITCHING
By Arthur Bessey Smith

The following brief outline shows the scope of this work: The magneto receiver, local and common batteries, instruments, private lines and exchange, multiple and "feature" switchboards, automatic switching and telephone instruments, 100, 1000 and 10,000 line exchange, party lines, multi-office exchange, large city systems, private automatic exchange, power plants, testing and adjusting, toll, phantom circuit, loading of lines, measured service, index.

The price of TELEPHONY, including AUTOMATIC SWITCHING, is $2.50

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AMERICAN CROSSARM & CONDUIT CO.
14 Mills — Main Office—Chicago, Ill. — 38 Warehouses
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Super-Service on rush orders!

If you are in a hurry your order can be loaded and on the way the same day we receive it. Quality poles since 1882 assures you of guaranteed stock and satisfactory dealings. Let us quote you prices.

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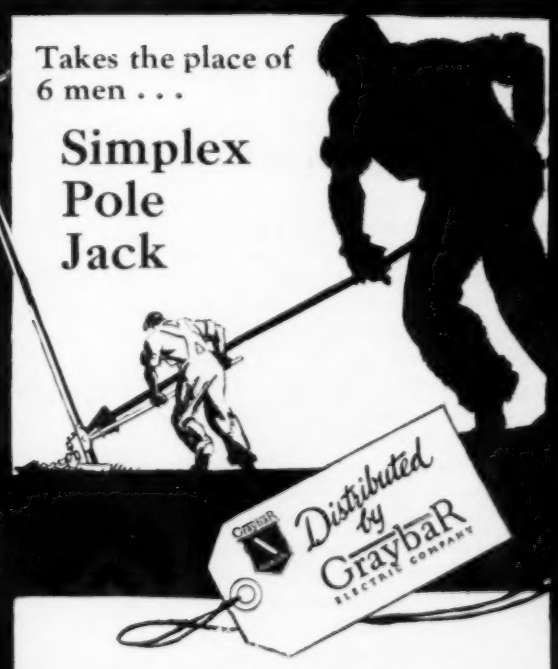
Guaranteed N. E. L. A., W. R. C. A., N. W. C. A. Grades
Treating Plants and Concentrating Yards
Minnesota Transfer, Minn., Newport, Wash.
Other Concentrating Yards at British Columbia Points
There Are No Better Poles Than Those Produced by
BELL LUMBER & POLE CO.
Security Building Minneapolis, Minn.
Long Distance Phone Atlantic 2304

Takes the place of 6 men . . .

Simplex Pole Jack



Templeton, Kenly & Co., Ltd.
Sole Manufacturers
Established 1899 Chicago, Ill., U. S. A.

Cedar Poles
Northern White Western Red
Plain or Treated Butts
Prompt Shipment from Minneapolis Yard.
T. M. Partridge Lumber Co.
Minneapolis, Minn.

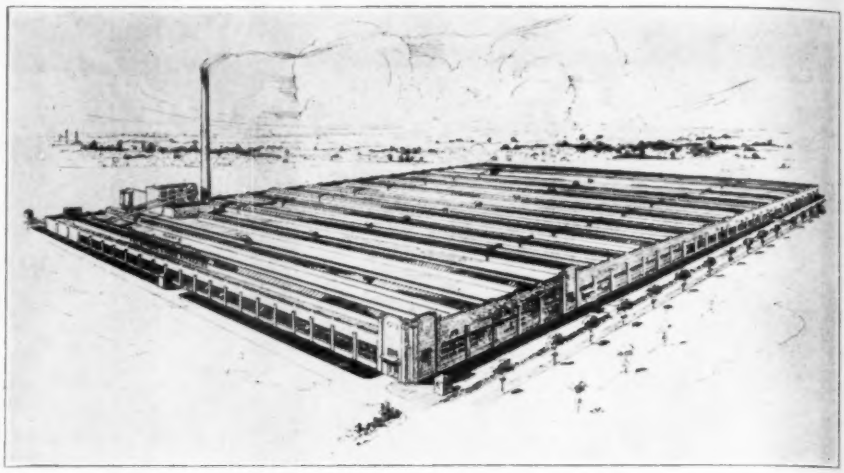
Stromberg-Carlson Expands Facilities

The big, new Stromberg-Carlson plant in Rochester where both radio receivers and telephone equipment will be manufactured has been completed and is ready for the busiest season in the company's history. Every effort has been exerted to make this structure justify the title, "The Best Telephone and Radio Factory in the World." The grounds include 28 acres, while the factory building measures 625 by 460 feet over all and covers approximately 360,000 square feet of floor space. The plant is a single building, one story high, divided into four units with a basement under one of them. A private siding enters the property from the adjoining New York Central main line. A shipping and receiving platform of car-door height and ten feet wide runs the full length of the building and can accommodate at one time a dozen freight cars and a fleet of trucks and cans. A spare track over 750 feet long will take care of any extra cars. Concrete driveways lead to either end of the platform and the space between the rails of the siding is filled flush with cinders, making any part of the loading platform available to trucks.

The style of construction used on this plant is the monitor type. Fifteen monitors, like inverted troughs with windows on either side, run through the building from east to west, with the supporting trusses within the monitors themselves, covering spans usually of 60 feet, but of 100 feet in one section of the plant. Such construction makes possible a wider space without supporting posts and thus increases clear space in the factory. The reduction in the number of posts makes possible the more efficient placing of machinery and benches. Another advantage of monitor type construction is that it insures perfect light to every part of the working area.

In heating, steam is led to units in the center of each monitor and equitably distributed by means of heating ducts, hung in the tops of the monitors where they do not interfere with the lighting. In the cabinet shop an ingenious filter system removes any dust made by the cabinet machinery, which fails of being exhausted by the usual collector system, before it reaches the heating coils.

One of the outstanding features of the new Stromberg-Carlson plant is the huge radio assembly department with a continuous belt for carrying the completed chasses down to the final testing room. All throughout, whether in plating department, japan department, braider room, or cabinet shop, the latest type of equipment has been installed.



New factory of the Stromberg-Carlson Telephone Manufacturing Company, which will be occupied by the company shortly

As the company manufactures both telephone and radio equipment, activities common to both fields are grouped together. Many of the machines can be used for either telephone or radio work and most of the employes can be assigned to either field. This insures both labor and machinery being used to the best advantage, for it is possible to transfer men from one field to the other as the necessity arises and thus retain an experienced force. Practically all the work connected with the manufacture of telephones, switchboards, radio receivers, and loud speakers from the making of parts to their final assembly will be carried on entirely under the roof of this one plant. Stromberg-Carlson is one of the few radio manufacturers that maintains its own cabinet making department.

Every effort has been made to minister to the comfort and safety of the employes. The very fact that the building is one story insures rapid exit in case of emergency and many doors are provided for expediting such a process. The layout of the departments and the guarding of machinery have been especially designed for safe working conditions. A large and well-equipped dining room, very ample toilet accommodations, and two large parking spaces, one of these indoors, are other important provisions for employes' convenience.

The external appearance is extremely inviting and those who have passed it on the New York Central have often commented upon the attractive appearance of the athletic field which is visible from trains. Shrubs and climbing plants add beauty to the grounds.

Cedarmen Issue Attractive Folders

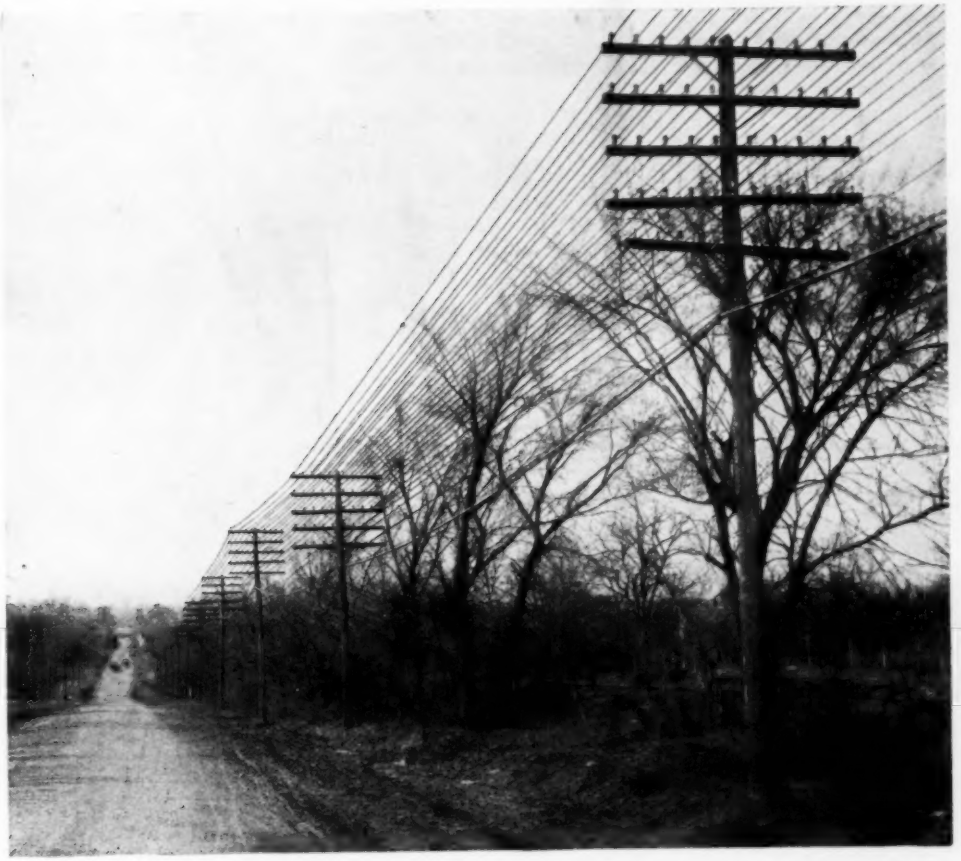
The Northern White Cedar Association, through its secretary at Minneapolis, has had some very attractive folders printed showing the economy of using northern white cedar poles for telephone construction. It is claimed that northern white cedar has "proved in" as best suited for telephone line use, and are shipped under more exacting specifications than heretofore.

You will find in TELEPHONE ENGINEER several of the most representative dealers in northern white cedar products; write them your wants and ask for quotations and specifications. Data will be supplied showing the many advantages in the use of this timber.

Transfer Is Deferred

Bellefontaine, Ohio—The payment of $1,750,000 to the holders of common stock of The United Telephone Company, Bellefontaine, by the Sweezy Corporation, of Alliance, for 10,000 shares of stock, which was planned for April 20, has been deferred temporarily, the Sweezy Company reporting that they would be unable to exercise their option of purchase on the data as first planned.

Northern White Cedar Poles



Northern White Cedar Poles in lines of Kansas City Telephone Co. Set in 1903

Assured Service

Nature and time have not changed the development of the trees from which Northern White Cedar Poles are produced.

Those produced today are as good in every respect as those that pole users purchased a half century ago. They have the same ideal combination of advantages . . . . light weight, strength, good appearance, proper taper, and long life.

At any time during the life of Northern White Cedar Poles, you can cut gains and install new cross arms without exposing poles to decay.

Northern White Cedar Association
Minneapolis - Minnesota

Time-Tested – Why Experiment?

News of the Manufacturers

"Bill" Strehl with Kellogg

Mr. Wm. C. Strehl (Bill as he is better known to his friends in the telephone field) has entered the service of the Kellogg Switchboard and Supply Company. He will represent the Kellogg company in the state of Kansas.

Bill started out in 1911 as switchboard installer's helper when the Kellogg Switchboard and Supply Company installed the common battery switchboard for the LaCrosse Telephone Company at LaCrosse, Wis. In 1912 Bill went west and spent considerable time on the Pacific Coast, during which time he was employed by the Western Electric Company as telephone switchboard installed in many of the coast cities.

Returning to his home in 1916, he entered the service of the LaCrosse Telephone Company at LaCrosse, Wis. During the next few years he was switchboard maintenance man for that company until 1926. From 1926 until 1929 Mr. Strehl as telephone expert in the telephone field of Wisconsin, Minnesota and Illinois assisted the Independent telephone companies with their equipment troubles.

Bill served in the Signal Corps during the war installing switchboard equipment in many camps. After the war he was very active in the American Legion and 40/8, serving one year as vice commander of the Wisconsin State Department. He was also active in many civic and fraternal organizations in LaCrosse.

D. P. Hoffman Joins Forces of James R. Kearney Corporation

James R. Kearney Corporation, 4224 Clayton avenue, St. Louis, Missouri, manufacturers of overhead and underground utility equipment, announce that Joseph D. P. Hoffman has jointed its engineering staff as assistant designing engineer. Mr. Hoffman was a graduate of University of Missouri in 1925 with B. S. in electrical engineering. Since that time he has been employed by the Southwestern Bell Telephone Company as field exchange engineer in Kansas City, Missouri, Little Rock, Arkansas, and St. Louis, Missouri.

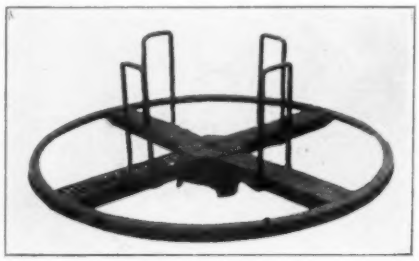
New Drop Wire Folder

An interesting new piece of literature has just been released by the Kellogg Switchboard and Supply Company dealing with drop cords and their importance in maintenance costs and subscribers' good will. It's called "They May Look Alike, But . . ."

You can have a copy of this folder by addressing the advertising department of the company.

Highway Pay-Out Reel

Highway Pay-Out reel weighs 32 pounds and is very light however, sturdy in construction, having folded coil arms which will permit them to be stored very easily and compact. These arms are adjustable, having three different sizes of



Highway Trailer Co. new pay-off reel

coils and there is a minimum friction on wire when it is being paid out due to small surface of reel rim, the double coil arms prevent distortion of coils, the reel bed spokes are slightly dished upward so that reel rim carries load of coil. Several of these coils can be mounted on a trailer and will be found very practical in public utility work.

Fast Work Restores Kingsport Service After Fire in Exchange

Twenty-four hour delivery on a Kellogg switchboard last week helped the Inter-Mountain Telephone Company to restore service at their Kingsport, Tenn., exchange after a fire which destroyed the entire central office equipment.

Fortunately, two weeks before, an order had been placed with the Kellogg Switchboard and Supply Company for the three section, nine position service switchboard. This equipment is to have three local positions, one universal position, four toll, and one hospital position.

The news of the fire was telephoned to the Kellogg Company by Mr. Griffin, superintendent of the Inter-Mountain Company, and a little quick thinking on the part of Mr. S. A. Mounteer, special sales representative of the Kellogg Company, solved the problem. Of course, the equipment just ordered was not ready to be shipped, but it happened that Mr. Mounteer was able to ship, the very next day a four-position board, completely equipped and ready, which can be used at Kingsport until the large board is delivered.

When the new large board is cut in at Kingsport, the four-position board will be sent to Wytheville, Va., to replace the old central office equipment there.

After a consultation with Mr. W. M. McAnge, Jr., who was in Florida, the order was placed for the four-position board on Tuesday night.

On Wednesday morning, four sections, completely equipped with nine hundred lines, were shipped by express. The power equipment and miscellaneous apparatus was shipped Thursday morning.

The installation crew started for Kingsport at once and arrived Thursday to meet the new equipment.

Thus telephone service will be resumed at the earliest possible moment.

Cleveland Firm Gets Japan Contract

The Nippon Electric Company, manufacturer of telephone equipment, has awarded the H. K. Ferguson Company of Cleveland, Ohio, a contract for designing and constructing a third large manufacturing unit at Tokyo, Japan.

This new unit, like the two previously built by the H. K. Ferguson Company, will have heavy mat foundations and a structural steel frame encased in concrete, and will involve an expenditure of approximately $250,000.

Engineers of the H. K. Ferguson Company evolved a system of earthquake resistive design from their studies of the 1923 disaster and have been employing it for the past six years on all their work in Japan.

One of the Chance Company's Warehouses Destroyed

The Chance Company, Centralia, Mo., suffered a severe loss on April 9, when one of its warehouses in Centralia was destroyed by fire. Some sixty carloads of anchors, rods and other Chance products were stored in the building at the time of the fire.

It is stated that the fire will in no way delay shipments from this concern as they have warehouses in several cities throughout the country. Naturally a temporary reduction in stock resulted, but the large Chance factory is running night and day in order that a surplus stock be available at all times.

Engineers began immediately to plan a larger warehouse and it is understood that contract has been let to the Truscon steel Company of Youngstown, Ohio, for construction of a steel, concrete and tile fireproof building, 260x100 feet, to replace the one destroyed.

Naturally this progressive concern would not let any grass grow under its feet. We congratulate this firm upon its progress and foresight in rebuilding at once.

Kellogg Appoints New Works Manager

The Kellogg Switchboard and Supply Company, manufacturers of Kellogg telephone apparatus and Kellogg radio receivers, announces the appointment of Mr. Wm. J. Leighner as works manager.

Mr. Leighner comes to the Kellogg company with a background of twenty-six years' experience in the electrical manufacturing business. During this time he has been through every phase of production work, from errand boy to works manager.

Mr. Leighner's education was along technical lines. After finishing a four-year course in engineering at the Westinghouse Technical School, he made a connection in a production capacity with the Westinghouse Electric and Manufacturing Company, with which concern he was associated for many years.

For the past six years Mr. Leighner has held the position of works manager for Westinghouse plants located at South Bend, Milwaukee, St. Louis and Valdosta, Ga. He joins the Kellogg company with an exceedingly broad experience in all phases of production work, including storekeeping, timekeeping, cost and executive direction.

The Kellogg radio and telephone production schedule for 1929 will exceed anything heretofore attempted by the Kellogg organization, and Mr. Leighner is laying plans that will insure good service to customers on delivery of all types of Kellogg equipment.

Statement of the Ownership, Management, Circulation, Etc., Required by the Act of Congress of August 24, 1912,

of Telephone Engineer, published monthly at Chicago, Ill., for April, 1929.

State of Illinois, County of Cook, ss.—Before me, a notary public in and for the state and county aforesaid, personally appeared D. Weiner, who, having been duly sworn according to law, deposes and says that she is the secretary of the Telephone Engineer and that the following is, to the best of her knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor and business manager are:

Publisher—Telephone Engineer Publishing Company, Chicago, Ill.

Editor—R. V. Achatz, Aurora, Ind.:

Managing Editor—J. A. Smith, Chicago, Ill.

Business Manager—J. A. Smith, Chicago, Ill.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) —Telephone Engineering Publishing Co., 192 N. Clark St., Chicago, Ill.; J. A. Smith, 192 N. Clark St., Chicago, Ill.; Miss Agnes Leffert, Logansport, Ind.; W. J. Uhl, Logansport, Ind.; John H. Wright, Jamestown, N. Y.; T. P. Bearden, Baird, Tex.

3. That the known bondholders, mortgagees and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: (If there are none, so state.) —W. H. Graffis & Sons, Chicago, Ill.

4. That the two paragraphs next above, giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him. D. WEINER.

Secretary.

Sworn to and subscribed before me this 1st day of October, 1928.

(Seal) Anton O. Landes, Notary Public.

(My commission expires April 26, 1930.)

Kester Solder Company New Name for Chicago Solder Co.

Announcement has been made that the name of the Chicago Solder Company has been changed to the Kester Solder Company. It is stated that there will be no change in the personnel of the organization.

In making the announcement it was stated that the name of their product—Kester—had become so well known that it was deemed advisable to incorporate the name Kester into that of the company, hence the Kester Solder Company.

This organization has been taking the lead in the solder business for the past few years until it is known throughout the country.

The address of the Kester Solder Company remains the same, 4201 Wrightwood avenue, Chicago, Ill.

R. F. DeVoe Operates Under Individual Name

R. F. DeVoe, president of the former R. F. DeVoe & Company, states that effective April 1 the firm name will be known as R. F. DeVoe, with headquarters at 120 Broadway, New York City. This is the same located as formerly occupied by the firm.

Reconstructed Equipment

Western Elec. No. 1333 Common battery steel hotel set with straight line or 16-33-50 or 66 cycle harmonic ringers equipped with Booster coil talking Ckt. @	$ 6.75
Kellogg No. 6B Cordless P. B. X. board with 7 local lamp lines and 2 trunk Ckts. @ $50.00—10-local and 2 trunk type @	65.00
Kellogg No. 97 or No. 118 Common battery desk set complete with No. 404 or No. 259 Steel signal sets, straight line or 16-33-50 and 66 cycle ringer	7.00
Kellogg or Dean drop coils, 100 ohm 35c ea. 500 ohm @	.50
Western Elec. No. 329 Transmitters with back & mouthpiece @	1.25
Western Elec. No. 250 or 229 Transmitters with back and Mouthpieces @	1.15
Western Elec. No. 143 Receivers with cords @	1.25
Gray 3-slot wall or desk type paystations @	5.75
Gray 5c single slot desk or wall type paystations @	1.25
Kellogg No. 30A combine line drops and jacks per strip of 10 @	12.50
Stromberg No. 986 C. B. desk set complete with No. 1132 Steel bell box with straight line or 16-33-50 or 16 cycle ringers @	6.75
Kellogg No. 34 2-M. F. Condensers @	.40
Western Elec. No. 20 desk set with W. E. Trans. & Rec. and new cabinet inside connection signal set 3-bar 1000 or 1600 ohm $10.00—4-bar $10.75—5-bar @	11.75
Kellogg No. 22 L. C. Transmitters with back and mouthpieces @	1.10

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Write for complete details

Unique Manufacturing Co.
221 Whiting St. CHICAGO, ILL.

Kellogg Representative Helps Restore Service After Winnebago Fire

Quick work on the part of Kellogg's northwest representative, Mr. Jay Houghtaling, enabled the citizens of Winnebago, Minn., to resume their normal telephone service within a few days after the exchange of the Blue Earth Valley Telephone Company was unfortunately consumed by fire last January.

The exchange was completely destroyed by the fire, the only equipment saved being the operator's hand set which she wore when she ran out of the building.

Mr. Houghtaling, who was in Mankato when he learned of the calamity, rushed to Winnebago. He and Mr. Eckles, manager of the exchange, in conference with thirty-five or forty business men of the community took stock of the situation to see what the next move was to be.

It was decided that instead of reinstalling new magneto equipment to replace the old magneto board, they would seize the opportunity to modernize the system completely. In consequence, they purchased a Kellogg multiple service board of the latest type equipped with 340 lines.

As soon as the decision to purchase common battery equipment was made, Mr. Houghtaling telegraphed for the main distributing frame to be sent at once from the Kellogg factory while he took the train to St. Paul to secure a temporary magneto board until the new switchboard equipment arrived.

This temporary board is now serving the community but it soon will be replaced by the up-to-the-minute Kellogg installation which will give the citizens quicker and more accurate telephone service than they have ever had.

FOR SALE

2 conductor black silk desk stand and receiver cords, per set, 40c. W. E. No. 47 fuses, $6.00 per 100. W. E. No. 14 terminals, 16 pair less stubs @ $4.00. W. E. NEW 3 conductor swbd. cords with No. 109 plugs attached, 50c. Heminway No. 42 glass insulators @ $5.00 per 100.

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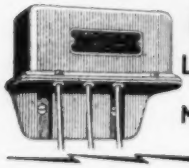
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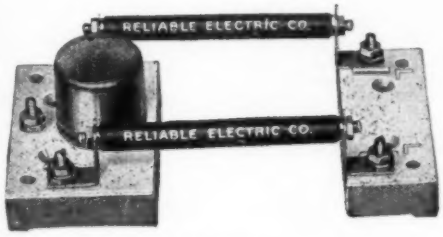

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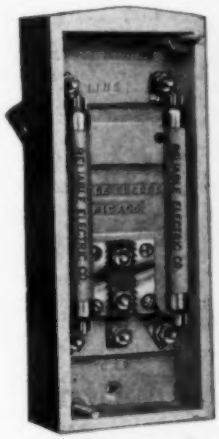

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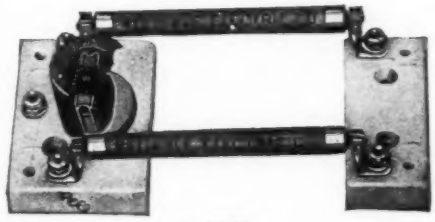

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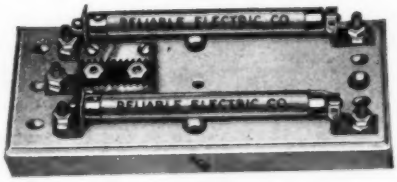

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Premier Electric Company 1800-4 Grace St. Chicago, Ill.

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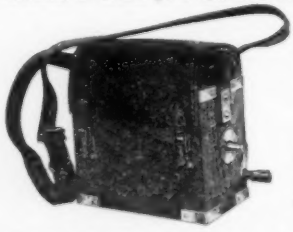
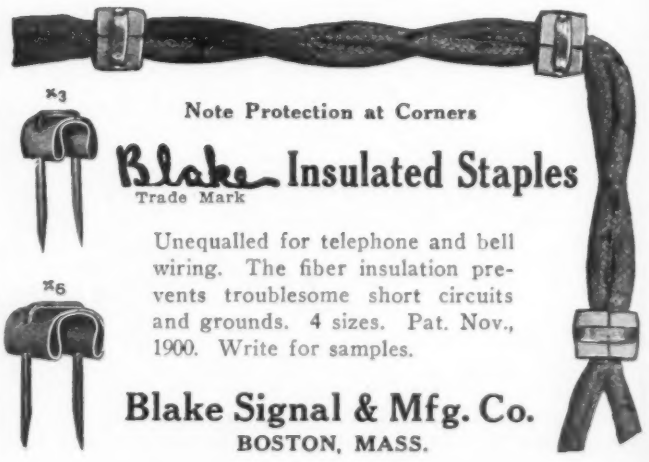
The "STEWART" Test Set tells which way and how far trouble is from you without cutting the line for test. It is equipped with detector coil as well as shunt method. Has transmitter circuit, making complete telephone. Thousands in use. Sent on trial. Price $32.00.



Send in your old set, we will make it work like new at a fair price.

Also Cable Testers, Test Cabinets and Detecto-Meters.

STEWART BROTHERS
OTTAWA - - - - ILLINOIS



Note Protection at Corners

Blake Insulated Staples
Trade Mark

Unequalled for telephone and bell wiring. The fiber insulation prevents troublesome short circuits and grounds. 4 sizes. Pat. Nov., 1900. Write for samples.

Blake Signal & Mfg. Co.
BOSTON, MASS.